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Report of the Chief of the Forest Service, 1967

United States Department of Agriculture

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U.S. Department of Agriculture,
Forest Service,
Washington, D.C., March 25, 1968.

Hon. Orville L. Freeman,
Secretary of Agriculture.

Dear Mr. Secretary:

I am pleased to submit this report as a brief summation of the major activities and accomplishments of the Forest Service during the past year.

The accomplishments are the result of thousands of individuals working faithfully in a common cause: To protect, enhance, and build America's forest and related natural resources in the best interests of all the American people.

In our three main lines of work—forestry research, State and private cooperative forestry, and national forest management—you will find outlined some exciting examples of resources in action. We feel that they are significant advances toward the goals you have set for the years ahead.

Sincerely yours,

Edward P. Cliff

Edward P. Cliff,
Chief, Forest Service.

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This report covers calendar year activities unless otherwise identified. Records on a fiscal year basis are so reported. Mention of commercial companies, products, or services is solely for necessary historical identification and implies no endorsement.

The Forest Service, U.S. Department of Agriculture, is dedicated to the principle of multiple-use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the national forests and grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

Issued April 1968

Report of the Chief of the Forest Service, 1967

Introduction—Highlights

In June of 1967, Secretary of Agriculture Orville L. Freeman issued a new policy statement titled "Resources in Action—Agriculture/2000." This document set down in outline the conservation policies which the Forest Service and other agencies within USDA will follow in the years ahead. These new guidelines are helping the Forest Service make the highest contributions possible toward the "conservation of man's total environment."

That statement of policy deserves serious study by every member of the Forest Service, as well as by every citizen who is or will become actively and personally involved in the noble work of building a more wholesome environment for all.

In the document, Secretary Freeman said:

> Once again we are in a conservation crisis that is a matter of urgent public concern. At stake is the quality of our total environment. The crisis will not go away. It demands action now. It demands intelligent, purposeful direction at all levels of government and personal involvement by all citizens. Conservation is a physical task, a social philosophy, and an economic necessity. Pure air, clean water, stable soils, productive crop, pasture, range and forest lands, abundant wildlife, natural beauty, and the opportunity for man to live in harmony with his natural environment are essential. They are interrelated and mutually supporting objectives. We commit ourselves to meet this great challenge, to continue our tradition of helping men throughout the world to help themselves, and to move forward with bold new actions needed to restore, conserve, and wisely use our natural heritage and maintain it for future generations.

Secretary Freeman made it clear that it is USDA policy:

—To produce enough timber to meet our expanding domestic needs in the year 2000 and beyond, and to strengthen our economy through increased exports of forest products.

—To intensify research programs that will support and advance the wise use of all forest and related resources throughout rural America.

—To intensify protection, management, and development of national forest system resources so they contribute fully to local and national economies as sources of water and timber for industry, as a base for tourism through recreation and wildlife, as grazing lands for livestock, and as esthetic attractions.

—To develop and expand cooperative forestry programs that will insure the protection, development, and management of privately owned forest lands at levels which will help meet the Nation's expanding needs for consumer products, contribute maximum benefits to people and communities, and create an environment enhanced by the beauty and stability of forested watersheds.

These long-range goals were set by the Secretary:

—Complete the basic development of the national forest system, including roads and trails, and keep additional development current with changing needs.

—Round out the national forest system through land purchase and exchange to provide more efficiently the public services and benefits that will be required.

—Safeguard rare and endangered species of animals, plants, and fish through habitat improvement and appropriate resource management practices in cooperation with State governments and other organizations.

—Attain optimum productivity on national forest rangeland and national grasslands through rehabilitation, development, and intensive management.

—Establish a forest conservation program to help close the projected timber supply gap and to meet other demands by increasing the rate of forestry accomplishment on private lands within the framework of multiple-use management plans developed for each ownership.

—Intensify the protection of privately owned forests from fires, insects, and diseases to safeguard the multiple values of forests.

—Increase financial and technical assistance to the States for the production and distribution of genetically improved seed and tree seedlings.

—Provide stepped-up forest products utilization and marketing assistance services to improve product quality, encourage fabrication of new products, and increase production and distribution efficiency—thereby improving the relative position of forest products in the marketplace.

—Establish an urban forestry program designed to achieve maximum benefits from trees and shrubs in maintaining or improving the environment of cities, suburbs, and communities.

—Develop a research capability sufficient to lead and support the full range of forestry activities throughout the Nation.

—Expand the dissemination of forestry research information to reduce the time lag in the application of research findings on private lands.

This is our blueprint for the years ahead. It is applicable to every aspect of Forest Service work. It has meaning for every individual in the Forest Service and, in a larger way, for every citizen of this country.

Through initiative and dedication, as we pursue our daily tasks, we intend to achieve the full accomplishment of these worthwhile goals.

During 1967, we moved successfully toward these goals. The following highlights, as well as the entire report, record some examples of resources in action.

10.85 Billion Board Feet Harvested. Although the volume of timber harvested from national forests was less than last year, the financial returns exceeded that of 1966 by $7.9 million. The harvest for 1967 amounted to 10.85 billion board feet—1.29 billion board feet less than in 1966. However, total cash receipts from the sale of timber during 1967 amounted to $172.8 million; as compared to $164.9 million for 1966.

Fringe Benefits of National Forests. Apart from the major commercial and industrial impact of 10.5 billion board feet of timber, accounting for one-fourth of all sawtimber in the country, numerous fringe benefits accrue to individuals living in the immediate vicinity of these forests. Our rangers make thousands of small sales to local rural people each year. This might be called the "nickel and dime" business of national forests. For example, in the past year, 17,433 sales ranged from $300 to $2,000, and generated into the local economies more than $100 million in business.

In addition, there were 87,549 sales of special forest products, such as Christmas trees, floral greens, shrubbery, naval stores, and other small items—further benefiting local people. Beyond this, we issued 92,587 free-use permits, allowing local residents to gather dead and down fuelwood, fenceposts, plant stakes, and other materials valued at $276,504 for personal home use.

More Than a Billion Trees Planted for 10th Year. Throughout the United States on all public and private lands, 1,407,690 acres of trees were planted in fiscal 1967, including windbarrier plantings. At an average of 800 trees per acre, this amounted to 1 billion, 120 million trees. This was an increase of 87,871 acres over 1966 plantings. (Since our figures are compiled by acreage rather than number of trees, plantings are usually reported in acreage.) Forest plantings, including those for Christmas tree production, amounted to 1,374,000 acres, and windbarrier plantings 33,667 acres.

It was in 1957 that all plantings went over the million-acre mark (a billion trees), and it has gone past that figure every year since. In two of the years, 1959 and 1960, plantings exceeded 2 million acres. This year made the 10th straight year that planting on all land exceeded the 1-million-acre figure.

Top States in the planting sweepstakes were Oregon, 164,054 acres; Florida, 157,908; Georgia, 135,249; and Alabama, 98,269. Private landowners planted 1,016,385 acres, or 70 percent of the total; States and non-Federal agencies planted 67,422 acres; and 322,716 acres were on Federal lands. More than half the planting in 10 of the 11 top States was on industry owned land.

Recreation Use Shows Increase. In 1967, the Forest Service reported 150 million visitor-days of use on national forest system lands. While this appears to indicate a slight decrease in use from the 1966 figure of 151 million visitor-days, it actually reflects more intensive standards of measurement. Again in 1967, we expanded the statistical sampling of the use made of recreation areas. In addition to having statistically sampled over 600 recreation sites, a new system of measuring recreation use on an entire ranger district was tested and found reliable, as was a method of measuring total recreation use at a winter sports site. As evidenced by comparing use at sites statistically sampled both years, outdoor recreation is continuing to expand and over-use of facilities remains a serious problem.

Turning Dropouts Into Trained Men. A unique arrangement between the Forest Service and the International Union of Operating Engineers met with great success in 1967. Union instructors teach heavy equipment operation to select Corpsmen at the Jacobs Creek Job Corps Conservation Center on the Cherokee National Forest in Tennessee. Graduates of the first class moved right into jobs paying an average of $3.25 an hour. The 12-month course furnishes training in maintenance and repair of heavy equipment, as well as in the actual operation of bulldozers and the like.

Four New Visitor Centers in 1967. Four new visitor centers were opened to the public this year—Cranberry Mountain, Brasstown Bald, Cape Perpetua, and Earthquake. The Cranberry Mountain Visitor Center on the Monongahela National Forest in West Virginia graphically presents resources and benefits of the forest. At the highest point in Georgia, 4,784 feet, the Chattahoochee

National Forest's Brasstown Bald Visitor Center offers a striking view of the surrounding area. Inside, exhibits show the use of the land and its resources from the time of the Cherokee Indians to the present. On the Oregon coast the forces of nature where the forest meets the sea are portrayed in the Cape Perpetua Visitor Center on the Siuslaw National Forest. And on Montana's Gallatin National Forest the Earthquake Visitor Center relates the geologic story of the 1959 earthquake at that site.

Wilderness. When the National Wilderness Preservation System was established in 1964, the 54 National Forest Wilderness Areas containing about 9 million acres were put into the system. The Wilderness Act required the Forest Service to complete studies and make recommendations for or against wilderness status on one-third of the 34 National Forest Primitive Areas, totaling about 4½ million acres, by September 1967. This schedule has been met. The reviews resulted in recommendations by Secretary Freeman calling for 12 additions to the National Wilderness Preservation System.

Receipts Reach Record High. Forest Service cash receipts from the use of all resources in fiscal 1967 reached an all-time record at $182,663,889—an increase of $8.8 million over the previous year. National forest timber sales brought in 94.5 percent of this; the remainder came from grazing fees, recreation concessioner's permits, and other uses.

Some national forest receipts are not counted in this record total. Sales of Federal Recreation Area Entrance Permits place revenue directly into the Land and Water Conservation Fund. States receive revenue from fishing and hunting licenses, though the sportsman may take his game entirely from national forests. Fees for water-power licenses are paid to the Federal Power Commission, and mineral leases on national forests are handled by the Bureau of Land Management, Department of the Interior.

Record $41.9 Million Returned to States. The increase in timber and other receipts resulted in a record $41.9 million being returned to the States in which national forests are located. This is the "25 Percent Fund" which the States receive annually to distribute for support of public roads and schools in the counties where the forests are located.

Forest Survey Progresses. About 48 million acres of commercial forest land was inventoried under the forest survey carried on by the Forest Service and cooperating State agencies. Reports appraising the forest situation were issued for eight States or portions of States. Congressional action increased the funding of this important, continuing project.

"Silage" From Sycamore. Yields of wood fiber equivalent to 4–5 cords of pulpwood per acre per year seem possible as a result of recent studies with sycamore. Researchers started with the knowledge that hardwood sprouts from stumps outgrow seedlings during early life. Using a plantation of 5-year-old sycamore, the area was clear cut. Then, as the sprouts emerged from the stumps, the area was harvested at various periods of time. Tests have indicated that 60–70 tons of green material per acre can be harvested in a 5-year growing period, and that this can be increased by harvesting every 2 or 3 years.

Logging With Shears. Huge, powerful tree-cutting shears, which operate like giant scissors, are attracting great interest in the forest industry. These hydraulic shears can rapidly fell, limb, top, and buck trees, significantly increasing man-day productivity of workers, besides reducing harvesting costs.

Airborne Fire Detection Technique. Forest Service scientists have developed an electronic system that automatically pinpoints small fire locations from fast, high-flying aircraft. The system uses a target discrimination module which flashes a warning when an infrared scanner picks up a "hot" target and automatically marks its location on rapidly processed film. Simultaneously, the location of the aircraft is determined by a Doppler radar linked to a small computer.

Pulpwood Demand To Double by 1985. A recent study indicates that the demand for pulpwood in U.S. mills in 1985 may be about 120 million cords—more than double the amount used in 1967. Meeting this demand will require broadened supply sources, such as fine sawmill residues and hard hardwoods; technological improvements in logging, wood handling, and transportation; and greater investment in forest management programs.

Log Exports Increase. Log exports between 1959 and 1966 rose from 0.2 billion board feet to 1.4 billion board feet, a sevenfold increase. Trends during the first half of 1967 indicate that the total for the year may be about 1.7 billion board feet. Most of this is due to increased shipment of softwood logs to Japan from the Pacific Northwest.

Increases in Demand and Prices. A study of the demand and price situation shows that domestic consumption of industrial timber products in recent years has been above expectations. The study also shows significant upward trends in the prices of stumpage, logs, and hardwood lumber.

"Water for Peace." A program on "Water for Peace" was prepared and printed in the form of a report to President Johnson. One phase of the program included an International Conference on Water for Peace which was held in Washington, D.C., during May 21–31. It was attended by 3,000 participants from 94 nations of the world. The role of forested watersheds was the dominant theme.

Fire Defense. Fire research personnel advised defense agencies on wartime fire defense strategy and the thermal effects of nuclear and convention-

al weapons. Fire specialists participated in programs of the Advanced Research Projects Agency, the Office of Civil Defense, the Defense Atomic Support Agency, the Bureau of Naval Weapons, and the Army Research Office. Forest Service scientists also presented technical papers to the Tripartite Technical Cooperation Programme at Washington, and to the combined Air Staffs of the United States and Canada.

Civil Rights. The Service continued a strong effort to provide fair employment opportunity for minority group members. Nationwide needs were determined. Qualified minority group members were placed in key staff positions in business management, programing, teaching, and counseling.

Polluted Air Kills Trees. Emission of toxic fumes from industrial complexes and other sources has long been suspect in the destruction of trees and vegetation in many parts of the Nation. After several years of investigation the Forest Service has established that gas emission from nearby industrial smokestacks is the agent responsible for the decline of white pine on the Cumberland Plateau in Tennessee.

Fire Conditions Worst Since 1910. Despite large, fast-moving fires in Washington, Oregon, Montana, and Idaho, the loss of forested land protected by the Service was held to 208,236 acres during 1967. The warmest and driest summer on record for these States presented fire-control forces with their toughest challenge since 1910. More than 3,500 fires occurred on the western forests between August 11 and September 12, but teamwork and fast initial attack stopped nearly all of them before serious damage was inflicted.

Training Foreign Nationals. The Forest Service prepared or assisted in the preparation of 103 forestry training programs or study tours for 252 foreign nationals from 38 countries. In addition, three refresher programs were prepared for Participating Agency Service Agreement (PASA) employees in the United States on home leave. The Chief's Office continues to be the focal point for providing assistance to foreign countries and to U.S. foresters serving overseas. More than 800 requests from scientists and professional workers in 50 countries were handled during 1967.

Computer Program Saves $3 Million. A computer program designed by two Forest Service engineers in Missoula, Mont., has saved an estimated $3,128,400 in its first year of operation. Used in locating and planning roadbeds, it examines all alternatives of cutting down hills and filling in dips to determine minimum hauling and excavation. Other State and Federal roadbuilding agencies are adopting this computer program.

FORESTRY RESEARCH is carried on by the Forest Service at eight regional experiment stations, the national Forest Products Laboratory, the Washington Office, the Institute of Tropical Forestry, and with cooperating universities. Scientists study the growth and harvesting of timber; protection of forests from fire, insects, and disease; management of rangelands and wildlife habitat; outdoor recreation; protection and management of watersheds; efficient and economical utilization of forest products; and forest economics. A continuing survey provides comprehensive information on the extent and conditions of forest lands, the volume and quality of timber resources, trends in timber growth and harvests, and the outlook for future supplies and demands.

Forestry Progress Through Research

Sex attractants have emerged from the scientist's laboratory as a possible potent instrument to destroy major tree killers. A breakthrough has been achieved with the western pine beetle. Every year this insect destroys about 1 billion board feet of mature ponderosa pine forests.

Entomologists have long sought to find and reproduce chemically the lures that enable insects to locate one another for mating. Recently scientists at the University of California and the Stanford Research Institute, supported in their research by the Forest Service, synthesized a major component of the female beetle's sex attractant that was capable of luring the male insects to a specific spot. The discovery opens up possibilities for breakthroughs in the control of other species of bark beetles. We hope such attractants will speed the development of safe, more economical, and more effective methods of combating major forest pests.

This is an example of Forest Service research at work in finding better ways to protect and improve forest resources. Research is also a key factor in attracting and keeping forest-related industries in rural areas and in improving the environment of rural communities. A recent example of development through research is the fast-growing southern pine plywood industry. Thirty new plywood plants have been established from Delaware to Texas in the last 3 years, and thousands of new jobs have been created to man them.

"A National Program of Research in Forestry" is an important new document prepared this year. This sets forth the research needs for the next decade and the goals to be achieved in forestry research under programs conducted by the Forest Service, State universities and land-grant colleges, and certain universities that participate in the McIntire-Stennis program. The report, within the framework of the national research program for the Department of Agriculture, provides a firm guide to help assure the research emphasis needed to solve many of our resource problems in the years immediately ahead.

FOREST FIRE RESEARCH

Remote Sensing Locates Fires

Airborne infrared fire mapping, only 2 years off the research drawing board, proved invaluable time and time again during the 1967 fire outbreak in the Pacific Northwest. The ability to rapidly and accurately locate the exact position of the fire edge and to plot its intensity, rate, and direction of spread when visibility is obscured by smoke and darkness meant that scarce manpower could be sent to the most critical spots first. This type of information could not have been obtained by any other means.

Late 1967 marked the debut of another remote sensing technique for fire detection. Forest Service scientists developed an electronic system that automatically pinpoints small fire locations from fast, high-flying aircraft. Fires are detected and accurately located while they are small. The system uses a target discrimination module which flashes a warning when an infrared scanner picks up a hot target and automatically marks its location on rapidly processed film. In a simultaneous operation, the location of the aircraft is determined by

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a Doppler radar linked to a small computer. During the 1967 fire season, more than 150 forest fires were detected at night and through dense drift smoke by this system in experimental flights.

Better Retardants Save Money

Aerial application of fire-retardant chemicals has been in operational practice for 10 years. But research is constantly developing new and improved retardants as well as modifying operational techniques so that aerial firefighting can be used in new fuel types and new areas of the United States. The introduction of air tankers to the upper Piedmont region of the Southeast saved over $70,000 in firefighting costs and 3,400 acres that would have burned in one national forest alone in 1967.

Fuelbreaks Keep Fires Small

Fuelbreaks again proved their effectiveness this year in California. Several fires with severe conflagration potential were stopped while still small with the aid of fuelbreaks. The fuelbreak concept was applied nearly 10 years ago. Wide strips along ridgetops and other strategic locations are permanently converted to grass or other ground cover of low-fuel volume. From these preplanned lines, fire crews can work more safely and rapidly to check incipient conflagrations. The 1967 fire season again demonstrated that fuelbreaks help to keep fires small.

FOREST ECONOMICS AND MARKETING RESEARCH

Pulpwood Demand May Double by 1985

A recently completed Forest Service study, "Timber Trends in the United States," indicates that the demand for pulpwood in U.S. mills in 1985 may be around 120 million cords—more than double the quantity used in 1967. Domestic pulpwood production in 1985 is expected to include 18 million cords of chips from plant byproducts and 101 million cords of roundwood. That prospective demand for roundwood is about 2.5 times the volume cut in 1967.

Given an increase in the cut of round pulpwood of this general magnitude, and assuming the cut of other timber products and the level of forest management would be about the same as in the recent Forest Service study, projected timber supplies would fall short of the total timber cut around 1980. This prospective supply deficit, along with declines in the size and quality of timber available to industry, points to continued intensification of the competition for wood, especially for the most desirable species.

The impact of rising costs is expected to bear most heavily on the lumber and veneer industries which require relatively large-sized and high-quality timber for low-cost processing. Because of its capacity to utilize the residues of other wood-using industries, small-sized low-quality timber, and the less desirable species, the supply outlook for the pulp and paper industry is more favorable. Better use of available wood supplies; technological improvements in logging, wood handling, and transportation; and improved protection and forest management are some of the responses indicated by this latest analysis of the timber situation.

Log Exports Continue To Rise

Between 1959 and 1966 log exports rose from 0.2 billion board feet to 1.4 billion board feet. The total for 1967 may be about 1.7 billion board feet.

Japan, the destination of 78 percent of the shipments in 1966, has been the principal market for the rapidly rising exports. Japanese projections of timber demand and supply indicate that their imports may double by 1970. This suggests that the pressures for expanded log exports from the Pacific Northwest may continue their rapid growth.

The heaviest log exporting is in western Washington, especially from Puget Sound and Grays Harbor ports. In these areas, the rise in log exports has increased competition for stumpage and logs and has contributed to the difficulties of the domestic industry—especially in terms of log supplies for the smaller nontimber-owning mills that must depend largely on securing public timber at a reasonable cost.

Although the volume is not large, some of the log exports from the East are also significant. For example, recent walnut log exports to Western Europe have nearly doubled the demand for this species and have contributed to the rapid rise in walnut veneer log prices.

Progress in Foresty Survey

During the past year, approximately 48 million acres of commercial forest land was inventoried under the forest survey carried on by the Forest Service and cooperating State agencies. Field surveys were conducted in Alaska, California, Indiana, Michigan, Mississippi, Montana, New York, Ohio, South Carolina, Virginia, and Washington.

Reports on the forest situation were issued for eight States or portions of States. Among these, the report on the third statewide survey of North Carolina's timber resources showed that commercial forest land has increased by almost 2 million acres since the first survey in 1938. Over this period the volume of timber increased by 3.7 billion cubic feet—a 25-percent gain. The new survey also showed that timber growth now exceeds cut by over 20 percent but that the margin of growth over a rising cut is narrowing. The large proportion of low-quality timber occupying valuable growing space is one of the major forestry problems in North Carolina.

The first survey of New Mexico's timber resources indicated an inventory of about 28.3 billion board feet of sawtimber on some 6.3 million acres of commercial forest land. Cutting in 1962, mostly sawlogs used in the manufacture of lumber,

amounted to about 240 million board feet. The predominant commercial species are ponderosa pine (57 percent) and Douglas-fir (18 percent). About three-quarters of the sawtimber volume is publicly owned. Over half of the sawtimber inventory is old-growth, subject to a high rate of mortality.

Prices for Southern Pine

The South has a thriving new outlet for pine, the veneer bolt market. As plywood plants open up from Texas to Virginia, forest managers are selling veneer bolts in addition to sawlogs and pulpwood. Principles of preparing price-comparison curves for the various products are illustrated and explained in a recently completed report. The resulting charts are useful to buyers as well as sellers of timber, and can be applied to any forest product.

The procedures as outlined can be used advantageously by veneer, pulp, sawmill, or stud mill managers in setting price policy. Measurements would have to be taken on a sample of loads and would have to provide for the variations in scaling practice common to the region. With such data it would be possible to make valid price comparisons among log rules, as well as with such other measures as standard cords, pulpwood units, or tons.

Pine Studs in Home Construction

In 1965 Georgia builders used over 40 million board feet of studs to frame exterior and partition walls in some 12,800 new single-family homes. Douglas-fir made up 47 percent of the total, and western pine 19 percent. Southern pine accounted for only 20 percent of the market.

The reason for the limited use of southern pine studs—cited by 93 percent of the respondents—was their lack of dimensional stability. Builders complained that they were usually too wet and warped. On the average, Georgia builders paid $24 more per thousand board feet to get Douglas-fir in preference to southern pine. Tighter quality control by southern pine producers would increase production costs, but this could be offset by higher prices for trouble-free studs and a bigger share of the market.

The study also revealed that Georgia builders generally preferred southern pine sills, girders, floor joists, ceiling joists, and roof rafters because of the strength, stiffness, and lower cost of southern pine. The demand for board lumber has been severely curtailed because of inplace cost advantages of plywood and other sheet materials.

South's Pulpwood Industry Continues Boom

The South's booming pulpwood industry again had a recordbreaking year in 1966, when a total of 33.1 million cords of wood was produced. This amount, nearly 61 percent of the Nation's total, went to 87 mills in the 12 Southern States and 10 mills outside of the South.

At the close of 1966, 11 new pulpmills were being built in the South and several others were announced. Alabama, Louisiana, Mississippi, and Texas each had two mills under construction, while Arkansas, Georgia, and South Carolina each had one. When these mills begin operating, they will increase the daily pulping capacity in the South by 7,835 tons—a 12-percent boost over 1966.

TIMBER MANAGEMENT RESEARCH

"Silage Sycamore" Pulpwood Shows Promise

Yields of wood fiber equivalent to 4–5 cords of pulpwood per acre per year seem possible from recent studies by the Forest Service, Georgia Research Council, and University of Georgia.

Not only could the harvest interval be reduced to 5 years or less, but farm implements used to harvest core silage could be used in place of conventional timber operations equipment. Since sycamore was used in the first experiments, the revolutionary method of growing and harvesting small-size pulpwood has been given the title "Silage Sycamore."

Researchers started with the knowledge that hardwoods send out sprouts from stumps that outgrow seedlings during early life. Using a plantation of 5-year-old sycamore, the area was clear cut. As the sprouts emerged, the area was harvested at various periods. Tests show that 60–70 tons of green material per acre (4–5 cords a year) can be harvested in a 5-year growing period, and that this production rate can be increased by harvesting every 2 or 3 years. (Thirty years is the normal pulpwood rotation using current methods of growth and harvest.) Preliminary pulping tests have proven the harvested material to be satisfactory in cooking time, yields, and paper quality.

Productivity of Lodgepole Pine

Determining the productive capacity of timberlands has been a serious problem of lodgepole pine because its growth in height and diameter is profoundly influenced by stand density. A workable solution was obtained through a West-wide study, which permits estimating productive capacity of a site from the relationship between height, age, and trees per acre. This method will improve management planning for lodgepole pine stands, the third most extensive timber type in the West.

Animal Damage to Pine Seedlings Reduced

Browsing by game and livestock causes extensive damage to natural and planted ponderosa pine seedlings. In central California, planting forage crops in mixture with pine substantially reduced damage to tree seedlings. Deer and cattle ate large amounts of the planted shrubs, grasses, and legumes, apparently in preference to ponderosa pine seedlings. Simultaneous planting of pine and alternate browse species appears to be a practical technique of reestablishing forests in the face of a high population of game animals or livestock.

Artificial Ripening of Cones

The short collection season limits the amount of tree seed harvestable at a reasonable cost. This season of about 1 month or less is normally limited to the time from natural ripening of the seed to seed release from the cones. Cones of grand fir in northern Idaho can be collected from 2 to 4 weeks earlier than normal without appreciably reducing the seed yield if the premature cones are partially immersed in a nutrient solution for continued ripening, it has been found.

Alders and Fungi

A PL–480 project in Finland accomplished the difficult task of isolating several strains of Actinomycetes (a group of fungi that decomposes organic matter) from root nodules and soil of alder stands. The presence of the fungi in alder root nodules stimulated tree growth. This partnership also resulted in enriching the soil with nitrogen that accelerated growth of other tree species planted with alder.

Fertilizer Responses Established

Knowledge on fertilizer requirements of native trees continued to progress. On irrigated pumice soils in Oregon, nitrogen applied at 200 pounds per acre increased height 6 percent, and at 400 pounds per acre increased height 19 percent over a 6-year period. On Sharkey clay soils in Louisiana, applications of nitrogen, phosphorus, and potassium almost doubled growth of 20-year-old sweetgum trees over a 5-year period. On Sawyer sandy loam soil in Arkansas, two annual applications of 100 pounds per acre of nitrogen fertilizer stimulated growth of a dense stand of 8-year-old loblolly pine, but the effect of such treatment lasted only 1 year.

FOREST ENGINEERING RESEARCH

Design of Efficient Logging Systems

Many logging enterprises fail or earn inadequate returns because of improper selection and use of available equipment. Simplified procedures have been developed for designing logging systems for Lake States hardwoods, and for selecting optimum combinations of men and machines for crawler-tractor skidding in the Rocky Mountain area. From 10 to 20 percent improvement in operational efficiencies is forecast. These guides will be of great use to loggers.

Logging With Shears

Huge, power-operated, scissor-like devices mounted on a tractor base can be used to fell, limb, top, and buck trees in the woods, thus eliminating dangerous manual saw operations and increasing productivity. Design criteria on the force, energy, and mechanics of crosscut shearing have been developed for five tree species of the Lake States to assist equipment manufacturers in designing logmaking shears.

Transporting Woodchips Through Pipelines

Research on design criteria for construction and operation of woodchip pipelines has progressed sufficiently to permit active planning by the Intermountain Forest and Range Experiment Station for full-scale pilot line for test and demonstration purposes. Results from the pilot line test will open the way for more efficient movement of wood supplies with a minimum of road costs and disturbance of watershed, scenic, and other multiple-use values.

Aerial Systems for Logging Difficult or Restricted Access Areas

Criteria were developed in the Pacific Northwest for design and operation of both balloon and skyline logging systems. These accomplishments are bringing to reality long-distance aerial yarding, which radically reduces road requirements and ground disturbance. Aerial logging will make it possible to harvest timber supplies that are presently inaccessible and will also permit harvesting in areas of sensitive recreation, esthetic, and watershed values.

FOREST GENETICS RESEARCH

Faster Breeding for White Pine

Progeny tests for breeding evaluation of parent trees is an expensive and time-consuming process because present techniques require making four sets of single crosses. Inheritance studies have now revealed that making a single set of crosses with a mix of 10 or more pollens will give a correct estimate of breeding value for blister-rust resistance. This means that the number of parents tested can be increased nearly fourfold with existing manpower and facilities.

Valuable Traits Favorably Related in Cottonwood

Cottonwood is our fastest growing tree on high-quality bottomland sites and can be vegetatively propagated to take full advantage of genetic improvement. Research in Mississippi shows that in cottonwood, longer fibers needed for pulping are associated with rapid growth and, in contrast to pines, specific gravity is independent of other traits. Breeders can now select more effectively for high specific gravity and rapid growth and also benefit by increased fiber length.

FOREST RECREATION RESEARCH

Blending Forest Management With Scenic Design

With forest development taking place on a massive scale, design concepts must help preserve the general integrity of forests and ranges and make them pleasant, meaningful environments. Today, since more tourists are on the highways, the view from the road and the picture it presents are becoming critically important. A study in the Sierra Nevada mountains showed that a highway traveler could see more than 57,000 acres along 16

miles of road—an average of 3,600 acres per mile. Management of about 5 percent of the area was classified as critical for scenery. Another 50 percent, though somewhat less critical, was still considered to be highly sensitive visually. These results emphasize that criteria for scenic categories should be established and that boundaries for such categories must be delineated skillfully. Studies to define scenic criteria are now underway.

Western Skiing Is Big Business

A study of the ski industry and skiing conducted in cooperation with the Department of Commerce in the 12 Western States (including Alaska), showed that skier visits totaled 1.4 million in 1955, 4.3 million in 1964, and that 12.1 million can be expected by 1976. About 95 percent of the skiers were residents of the Western States. The 4.3 million ski visits in 1964 were made by only 415,000 skiers—about 1 percent of the western population. This group spent $115 million during the season. Male skiers outnumbered females 2 to 1; two-thirds of the skiers were 30 years old or younger; average daily expenditure per skier was $21; skiers averaged more than 10 days of skiing per year; median annual family income of skiers was $9,500—$2,000 higher than that of the western population at large. Use was not evenly distributed. The large, highly developed cable lift operations were the most popular. Of the nearly 200 ski areas, 18 percent had 59 percent of the business.

Skiing is important economically in many rural communities. More than 15,000 man-days per week were required for operating lifts and tows, slope maintenance, and managerial and clerical work. Wages totaled $6 million, an average of $31,000 per ski area, and $88 million of the $115 million was spent by skiers while on a skiing trip.

Lift and tow capacities should be increased 2½ times to meet the estimated increase by 1976. With the exception of California, all Western States have an adequate supply of new areas with development potential for skiing.

Private Campgrounds Increasing

Private enterprise now provides the majority of campgrounds in the 14 Northeastern States. There are more than 1,000 commercial campgrounds from Ohio to Maine. The ratio of private campgrounds to public campgrounds is 3 to 1 for the region as a whole and goes as high as 7 to 1 in Maine. In 6 years, the number of privately owned campgrounds in New Hampshire increased from 11 to 108.

In New Hampshire the length of recreation visits, frequency of visits, and intention of return visits were all significantly influenced by major attributes of the campgrounds, the campground managers, and the campers themselves. Campground age, geographic location, number of family units, size of investment, and presence of water were all significantly important. Shorter and less frequent visits occurred at campgrounds that were small, new, and had low investments and no water for swimming. Visit lengths, frequencies, and return intentions were significantly reduced at enterprises where the diverse needs of campers were not recognized by management.

Recreation in Southern Industrial Forests

Surveys of recreation use on lands of the southern pulp and paper companies showed that 86 percent of this industry (38 companies) permit public access to some or all of their lands. Hunting is the principal activity. Thirteen companies leased part of their holdings to hunt clubs. All but two allowed fishing, picnicking, camping, boating, and hiking. Fifteen companies provided special facilities, such as boat-launching ramps, picnic grounds, campgrounds, and fishing access areas. Hunting without permission is allowed on the lands of 24 companies; eight issue a free permit, and six charge a fee. Annual fees per individual range from $1 to $10. Nine companies encourage hunting by distributing brochures, advertising, and display signs on their property.

A related study made in Brunswick County, Va., shows that one-fourth of the county's male residents hunted on pulp and paper company lands, each averaging 14 days per year. Company policies vary as to fees and use. Two-thirds of all residents and half the hunters knew nothing about the hunting policies of the four companies whose land they used. This suggests that companies should develop public relations programs to better inform hunters about company policy and programs.

Wilderness Use Grows In Boundary Waters Canoe Area

Trends in patterns of recreational use on the Boundary Waters Canoe Area, Minnesota, based on 1961 and 1966 data, showed that all types of visits to the canoe country (paddle canoeists, motor canoeists, boat campers, auto campers, resort guests, day-users) increased 19 percent, but visits to the wilderness area by paddle canoeists increased 52 percent. In contrast, the number of visitors who stayed on the edges of the BWCA and engaged in recreation activities that are not unique to wilderness declined 19 percent. In 1961, visitors traveling by canoe barely outnumbered those using boats; in 1966, over two-thirds of the visitors canoed; paddlers alone were half of those in all uses; boaters accounted for only 22 percent.

Campers and Campground Costs

An economic study of 21 national forest campgrounds in Colorado showed that:

1. Large campgrounds tend to be less expensive (per family unit) to maintain and operate than small. Large campgrounds, however, are not necessarily less expensive (per family unit) to build than small. Other elements, such as distance and topography, affect construction costs more than does the number of family units per campground.

2. The trend to "sleep off the ground" was reflected in 41 percent of all campers sampled using trailers, 17 percent pickup campers, and 38 percent tents. Those with tents and pickup campers used near-highway and back-country sites about equally, but families with trailers used near-highway campgrounds about twice as frequently as those away from the highways.

3. Neither campground size (total number of family units) nor the money spent by the Forest Service per family unit to build the campground influenced the amount of its use.

Watermeters Measure Recreation Use

A study on national forests in Michigan and Arizona shows that water consumption on developed recreation sites is highly correlated with recreation use. Watermeters, though more costly, have the following advantages over pneumatic traffic counters as indicators of recreation use: (1) They are less subject to vandalism, (2) require little maintenance, (3) are not affected by snow and ice, (4) provide supplemental information relating use to water and to plant requirements for sewage treatment.

ENVIRONMENTAL FORESTRY RESEARCH

Polluted Air Can Kill Trees

For many years the emission of toxic fumes from industrial complexes and other sources has been suspect in the destruction of trees and vegetation in many parts of the Nation. For example, after several years of investigating and eliminating other possible causes, the Forest Service identified gas emissions from nearby industrial smokestacks as the cause for the decline of white pine stands on the Cumberland Plateau in Tennessee.

However, air pollution is a new field in forestry research, and more information is needed on all aspects of air pollutants, as well as on how trees can be used to counter the ill effects of air pollution. This includes trees as detectors of dangerous airborne gases or as alleviators of pollution.

At the Forest Service's Southeastern Experiment Station, researchers are working with eastern white pine to measure air pollution. Trees are being selected that are sensitive to field concentrations of specific individual pollutants, and not to others, and that indicate approximate concentrations of the pollutant in the ambient air.

Today, about a dozen research projects are involved with air pollution and its relation to forestry. The U.S. Public Health Service is supporting several agencies in their studies of air quality as it relates to forests and trees. Research projects are expected to multiply as the problem grows. We hope to amass enough information to apply management techniques to our air resource, as we already do to our land and water resources so as to assure clean and safe air for the total environment.

Shelterbelts Respond to Good Care

Studies in the central Great Plains show that shelterbelts can be more effective with good management. Winter density can be greatly improved by cutting out excess rows of hardwoods that overtop evergreens. The evergreens, mainly pine and cedar, respond rapidly with increased vigor and growth rate. Density of shelterbelts near the ground, often impaired by past grazing, is also improved by cutting out excess hardwood rows. The cut stumps sprout, and the adjacent hardwoods branch close to the ground.

FOREST INSECT RESEARCH

Soil Insecticides Show Little Movement

The use of persistent chemicals in preventing termite attacks has caused concern because of possible contamination of wells and streams. In seven major soil types, water emulsions of the insecticides were applied to the soil surface at the rate of 1 pint per square foot. After 6 years, over two-thirds of the chemical remained in the top inch of soil, and usually less than 1 percent was found 4¾ inches below the surface.

Furthermore, neither bioassays nor chemical analyses have shown any insecticide present in a spring-and-swamp downgrade from large termite control plots established in Mississippi in 1956 and 1958. The two studies in these years indicate no significant insecticide movement through the soils studied, and little danger of contamination of wells and streams by them.

Formosan Termite Attacks Live Hardwood Trees

A variety of hardwood shade trees in New Orleans, such as Chinese elm, ash, oaks, and other species, have been found infested by the introduced Formosan termite. Nests occur in the soil, and the trunks are hollowed by the termites whose activities sometimes extend into the limbs. Although decay has been associated with infestation, it is not always apparent.

Remote Sensing Improves Pest Detection

Significant progress was made in the following areas of research for which the usefulness of aerial photography and other remote sensing imagery is being investigated:

1. The development of image specifications for detection of insect-and-disease attacks on forest trees.

2. The aerial photo identification of commercially important tree species.

3. The inventory of forage, livestock, water, soil, and recreational resources of wildland areas by means of multispectral remote sensing.

Multispectral sensing techniques showed that beetle-infested, dying ponderosa pine trees: (1) Are warmer by 2° to 7° C. than healthy trees, (2) change color with rate of blue stain development and number of developing beetles, and (3) transpire at a reduced rate.

Virus-spray Improved for Tussock Moth

At Corvallis, Oreg., pilot-scale production methods were developed in cooperation with private industry for a nuclear polyhedrosis virus of the Douglas-fir tussock moth. Production costs were high, but large-scale production can probably lower costs to an acceptable level. In addition, procedures were developed for quality control of industrial batches of virus. Water-base formulations for virus sprays were developed, which appear far superior to any used previously. These formulations are rainfast, compatible with virus and host insect, and maintain the pathogen in suspension.

Systemic Reduces Insect Damage

Field experiments with the systemic insecticide Bidrin, injected into slash pine seed production trees, 80 feet tall, in early May 1966, reduced attacks by the *Dioryctria* coneworm and the slash pine seedworm by 93 and 99 percent, respectively, during the final 4½ months of cone development. This approach shows promise for reducing the number of insecticide applications, lowering costs, and eliminating the need for precise timing of sprays.

Management Control of Red Oak Borer

Results in eastern Kentucky plots over the last 6 years indicate that the red oak borer can be at least partially controlled by manipulating a stand. Stands examined after logging disclosed that slower growing trees are preferred by the borer. Results of a 6-year study of three complete generations clearly show that the incidence of borer attack decreases as diameter growth increases, regardless of tree diameter class. Thinning operations during the second (nonattack) year of the life cycle of the red oak borer reduced the number of susceptible stems present for attack and increased tree vigor. Eventually, as the stand begins to fill in and stagnate, a return to pretreatment borer population levels would be expected.

FOREST DISEASE RESEARCH

Enzymatic Breakdown of Wood

Two radically new and significant facts about the nature of decay in wood have just been disclosed through the use of specialized staining techniques in combination with fluorescent lighting. Enzymatic breakdown of the wood substance has been found to occur only in the immediate vicinity of the fungus and is not widely diffused as was once supposed. The enzymes are brought into the cell wall by very small microscopic hyphae such as previously have been known only for soft-rot fungi. Both of these new facts help us understand the progression of fungal attack on the microstructure of wood and the nature of decay resistance. This may have considerable bearing on the problem of increasing the effectiveness of wood preservative treatments.

Pollution-Resistant White Pines

As an outgrowth of experiments to determine the suitability of eastern white pine as a useful biological indicator of polluted air, some seedlings of this species showed a great capacity for survival and growth under adverse atmospheres. Twenty-six of these "super-seedlings" carefully selected for resistance to both sulfur dioxide and fluorides, were exposed in an urban atmosphere in Tennessee where high concentrations of oxidants are known to occur. Five of these trees died and 12 were susceptible to the oxidants. The remaining 9 resistant trees are being further tested for resistance to all three toxicants as a potential genetic source of trees adapted to use in highly polluted areas.

Dwarf Mistletoes Reduce Tree Height

Dwarf mistletoes have long been infamous because of their effect on the diameter growth of forest trees in the West. Recent damage studies in the Pacific Northwest indicate that dwarf mistletoe reduces height growth of ponderosa pine even more than diameter growth. Appraisal of growth losses will be about 40 percent too low if height growth impact is ignored.

High-Infection Periods in Fusiform Rust

Damage to pines by fusiform rust is proportional to the amount of fungus inoculum on oaks, which are the alternate hosts, and to the capacity of this inoculum to produce sporidia which infect the pines, new research indicates. Maximum germinative capacity of the oak inoculum occurs in the mid-South within a 3-week period beginning in late April. The production of inoculum declines each succeeding week after that time, and by June essentially stops. This indicates that the pines are relatively safe from disease attack after this brief period in the spring. Application of control measures should be limited to this short period of high-infection hazard, for best results.

Blister Rust Infections for Study

The conditions favoring needle infection of eastern white pine by *Cronartium ribicola* have been further delineated by a Forest Service study grant to the University of Wisconsin. Knowing these conditions, technicians can now infect pine almost at will. This permits year-round study of blister rust resistance and the mechanisms of resistance. The critical factor necessary to control pine infection has been found to be daily temperature fluctuation within a range of 40° to 75° F. These fluctuations induce germ tubes to penetrate between guard cells and form vesicles which give rise to infection hyphae. With this knowledge, needle infection through stomata has now been demonstrated consistently and conclusively.

Scatter-Gun Pollinating

Significant gains have been made in testing pines for genetic patterns of blister rust resistance. Individual crosses made with equal-volume mixtures of 10 or more pollens of trees are useful in

rating new candidates being tested for transmission of rust resistance. Many more potentially resistant white pine candidate trees can be produced and field-tested using the mixed-pollen technique. With conventional breeding methods, this work would take many more years of effort.

Biochemistry and Root Rots

A possible biochemical explanation for: (1) The resistance of red alder to *Poria weirii* infection, and (2) the high susceptibility of Douglas-fir, has been advanced by our Pacific Northwest Experiment Station. Alder tissue has an enzyme that acts upon its own phenolic compounds. *P. weirii* apparently secretes the same enzyme. The added amount of this enzyme from the fungus during infection attempts further oxidizes the phenols and forms materials toxic to the fungus, and therefore infection cannot occur. Douglas-fir lacks both the enzyme and the phenols, so the limited enzyme from *P. weirii* produces no toxicant and infection can occur. These findings affirm the value of maintaining Douglas-fir and alder mixtures and may also aid the search for *Poria*-resistant strains of Douglas-fir.

FOREST PRODUCTS UTILIZATION RESEARCH

Patented Sawblade Reduces Waste

Research on finding ways to reduce waste products resulting from cutting logs into lumber has developed a sawblade which makes a thinner kerf (width of cutting path made by the saw) than is found in conventional blades. Traditionally, saws have always had a rather wide saw kerf, and little effort has been expended to develop thinner kerfs even though a substantial savings in usable wood can be realized for each 1/32-inch decrease in saw kerf. The FPL Taper-Tension Saw encompasses a 30-percent narrower saw kerf than is commonly used in the industry. It also exhibits a high degree of sawing accuracy over a wide operational range. The adoption of this sawblade by the sawmilling industry could result in an annual increase in recovery of solid lumber products valued in excess of $40 million.

Machine-Driving of Wood Guardrail Posts

Wood is an excellent guardrail post material with strength, cost, and service-life advantages over other materials. However, wood is not often used for highway posts in new construction because contractors prefer posts of competing materials that can be driven 2½ to 3 times as fast as wood posts can be set by hand.

Research conducted in cooperation with a guardrail subcontractor and equipment manufacturer developed a mobile post driver that can drive wood posts as readily as posts of competing materials. Savings of $1 to $2 per post over the cost of handsetting wood, and $1 to $3.25 over machine-setting posts of competing materials were indicated. Installation rates of 28 to 30 posts per hour can be expected on average sites. On difficult sites, the rates will be less. For example, on one difficult site, where posts of competing materials could not be driven nor could an auger be used, wood posts were driven at rates of 15 to 17 posts per hour.

The driving tests showed that posts with blunt bottoms drive better than those with slopes, and that the driving action causes no damage to the tops of properly machined wooden posts. These findings will also benefit the wood industry by providing added outlets for wood posts in the expanding highway construction field.

Tissue and Toweling From Appalachian Woods

Pulping and papermaking experiments were successful in demonstrating the suitability of a mixture of 80 percent Appalachian hardwood and 20 percent Appalachian softwood for high-quality facial tissue, toilet tissue, and toweling. Facial tissue was comparable to commercial grades in brightness, strength, softness, and absorbency. Toilet tissue had higher strength and absorbency but was less soft than commercial grades. Toweling had equal absorbency, high wet and dry tensile strength, and slightly lower softness than commercial products on the market.

The pulp used to make these papers was produced by low-yield kraft pulping. These experiments provided basic knowledge that would be needed to encourage the use of Appalachian woods by prospective mills that could be located where there are large quantities of hardwoods not now being utilized and close to large markets. For example, a single 500-ton sanitary papermill using at least 50 percent hardwoods would utilize about 500 cords of hardwood per day. The mill would provide employment for about 1,000 people, producing products having a total value of at least $100,000 per day.

Studs From Southern Pine Cordwood

Research has developed a process for converting 4-foot-length southern pine cordwood into 8-foot 2 by 4's of Southern Pine Inspection Bureau "Stud" grade or better. The process features finger-jointed and glued 4-foot sections from which all drying distortion has been removed. The studs are lighter, straighter, and more easily nailed than the denser southern pine studs to which the trade is accustomed. The process is timely, for it will benefit the wood industry and landowners of many southern pine plantations with trees now reaching diameters from 5 to 8 inches. The experiments showed that the studs are competitive in strength with studs made from some western species and are more than strong enough for their purpose.

New Ways To Attach Wood Panels

A new fast and economical method of attaching plywood paneling to existing interior walls has been developed by research aimed at increasing uses of wood in apartment rehabilitation projects.

The panel system, called "Fur-Lok," was recently installed at an onsite demonstration in a New York tenement building scheduled for 48-hour renovation.

Two carpenters, who had not used the system before, paneled an 8- by 17-foot room, including framing around two doors and three windows, in 3 hours and 23 minutes. With experience, this time could be cut by more than an hour. Speed of installation is of primary importance for products to be used in a recently developed 48-hour method of apartment rehabilitation that will displace the occupants for a minimum of time. The success of this panel system is due to a novel locking-wedge—one wedge is attached to the panel and one is attached to the existing wall—that eliminates the need for nailing the panels to the furring strips.

The research showed the Fur-Lok system fits in well with the concept of "instant rehabilitation," and can provide a basis for helping the plywood industry capture its share of a market that will call for 2.3 billion square feet of new walls in New York City alone. More importantly, this will help make it possible to provide decent housing for low-income families currently living in the tenements.

FOREST SOIL AND WATER RESEARCH

Planted Pines Reduce Streamflow

Streamflow reductions occur in the Appalachian Mountains when native hardwood is replaced by pine. Evidence of this is developing at Coweeta Hydrologic Laboratory where a white pine plantation is using more water than the hardwood forest it replaced. In 1957, when all hardwood trees and shrubs on a 40-acre watershed were cut, water yield increased about 6 inches per year. But now, with a 10-year-old pine plantation cover on the watershed, streamflow is 3 inches less than the yield predicted if hardwoods had remained. The disparity will probably increase since the young plantation has a basal area of only 30 square feet per acre compared with 85 for the original hardwood stand. In areas where water supplies are critical, when conversion of hardwood to pine cover is considered for improving timber values, the effect on water values should also be considered.

Roadbank Stabilization With Netting

Erosion on the steep fill slope of a newly constructed road in Idaho has been effectively controlled by a combination of netting and straw mulch. The fill slope, having an average gradient of 80 percent, was a typical problem soil of the Idaho Batholith—loose, weathered, granitic material that tends to erode excessively.

Eight plots were established on the fill slope and all were seeded and fertilized except one untreated control plot. Two of the plots were furrowed on the contour, but this was an ineffective treatment; in fact, one plot eroded more than the control. The straw mulch without the netting had an intermediate effect. The netting, however, bound the mulch snugly to the soil, minimizing erosion by overland flow. The mulch prevented raindrop impact and the resulting soil splash. Three types of netting were used: paper, jute, and chicken wire. All three were equally effective in reducing erosion to a negligible amount during a time when the raw slope was most vulnerable.

Summer-Deferred Grazing Reduces Erosion

Sediment movement decreased about 70 percent on the Rio Puerco drainage of New Mexico during a 5-year period of summer-deferred grazing. Under this type of grazing management, animals were excluded from the beginning of April until the end of October each year, and were allowed to utilize 55 percent of the alkali sacaton forage during the rest of the year.

The study took place on the San Luiz experimental watersheds, 58 miles northwest of Albuquerque, where the average soil loss was 0.7 acre-foot per square mile per year before fencing. After fencing was completed and deferred grazing initiated, the average soil loss declined to 0.2 acre-foot per year. Furthermore, during the uncontrolled grazing period, alkali sacaton cover decreased 34 percent in 6 years; but after fencing, it increased by 400 percent. Bare soil area decreased, although water runoff remained about the same.

Eroding Coal-Haul Roads

Erosion from abandoned coal-haul roads in eastern Kentucky amounted to almost 4 inches of soil per year from the road surface and banks. This is a very significant source of stream sedimentation that seriously affects the water quality in streams flowing from mined watersheds. Roads built on sandy silt lost 1.7 acre-feet of soil per mile of road each year, while those on clayey silt lost 3.3 acre-feet, almost twice as much.

Studies have shown that the problem can be alleviated by immediate treatment of abandoned coal-haul roads. All culverts should be removed, and better drainage provided by cross channels and dips. All road and bank surfaces should be stabilized by grass cover or legumes, with tree planting to follow on the more productive banks. If properly bedded down and maintained, these roads should have considerable residual value for fire control access and for recreational use, without endangering watershed values.

Soil Slips Follow Brush Conversion

Over 1,000 mass soil movements were counted on a 700-acre sample of the San Dimas Experimental Forest in southern California following extremely heavy rains in November and December 1965. Notably, 84 percent of those soil slips were on areas that had been converted from brush to grass following a wildfire in 1960. The conversion involved seeding to grass and an herbicide spray to kill the native vegetation competing with the grass cover.

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On the untreated area, deep-rooted native chaparral held the soil in place fairly well. On the treated area it appears that the roots of the killed chaparral had decayed to the point where they could no longer withstand the gravitational force of saturated soils on steep slopes. Another possible factor was the uniform rooting depth of the grass: a shear zone at this specific depth may have contributed to soil slippage.

No soil movements occurred on slopes less than 80 percent. Therefore, cover conversion for increased forage or water yield and reduced fire hazard may still be attempted, but only on the gentler slopes. Care must be taken to avoid the steep slopes even on small areas. A dense cover of deep-rooted species on the steep slopes should be encouraged.

Bog Runoff Not Well Regulated

Natural runoff from bog watersheds is not necessarily well distributed during the year. Records from four study-watersheds in the Lake States show that about two-thirds of the annual runoff occurs prior to June 1. High flows in the spring come when water tables are high and the bogs have little storage capacity. Conversely, low flows are prevalent during summer and fall, and runoff often ceases during midsummer dry periods. Ground water is not a component of flow in these bogs and stored water is not available for runoff. A drainage system would provide more storage capacity for storm water and would help to regulate streamflow.

RANGE RESEARCH

Heavier Calves From Seeded Ranges

Heavier, more uniform calves have been produced at Manitou Experimental Forest, Colo., by incorporating seeded ranges into a grazing management system along with native ranges. Calves weaned under this system averaged 32 pounds heavier and brought $7.70 more per head than calves raised entirely on native range. Chemical analysis of forage samples collected from the stomachs of grazing steers indicated the seeded ranges provided adequate dietary protein and phosphorus for 2 months longer than unseeded ranges.

Range Steers Eat Selectively

The species of forage eaten by range steers bears little resemblance to each plant's abundance on the range. This was revealed in cooperation with the University of Arizona, when accurate estimates of the species composition of the steers' food were obtained from samples of ingested forage. Forage samples were removed from the animal's stomach by means of a painless operation in the animal's side. Forage fragments were sampled and identified under a microscope. Grazing animals were found to be very selective in the choice of forage within seasons. Species composition of material in the stomach also changed with seasons.

Cattle Gain on Cheatgrass Ranges

Research conducted in cooperation with the Bureau of Land Management has shown that cattle can gain substantially on cheatgrass ranges. Yearling cattle on cheatgrass forage at Saylor Creek Experimental Range in southern Idaho made satisfactory gains from April to October. Gains per acre reached a maximum of 18.2 pounds when pastures were stocked at 17.2 animal-days per acre. In the spring, gains per acre were highest at a very heavy stocking rate.

Prescribed Burning Improves Southern Ranges

Controlled periodic burning and moderate grazing on longleaf pine-bluestem range in Louisiana stimulated forage production without drastic changes in protein and phosphorus composition. The widespread practice of winter burning briefly increases the protein and phosphorus in new growth. However, alternating the burning among different areas extends the period when nutritious forage is available. For example, these nutrients were substantially higher in June in forage harvested from plots burned in the spring than they were in forage from plots burned in the winter. Likewise, new growth on summer-burned range provided adequate protein and phosphorus after they became submarginal on spring-burned plots. By midwinter, protein on previously unharvested summer-burned plots was significantly higher than on plots burned earlier.

WILDLIFE HABITAT RESEARCH

Fire and Partridge Pea Germination

Both the rate and total germination of partridge pea seeds were increased in laboratory experiments which simulated fire conditions on a moist fuel bed. The response was caused by hydration and removal of inhibitory seed coat materials. Partridge pea is an important quail food in the coastal plain of the South. Explorations of the possible mechanisms by which fire may benefit partridge pea and other species of leguminous plants are providing insights into the year-to-year variations in the occurrence of herbaceous flora in pine stands which are burned annually.

New Browse From Old Shrubs

Topping appears to greatly increase the amount of browsable twigs on old shrubs. Without these new shoots, old shrubs contribute little to the available browse supply on deer winter ranges in southern Idaho and adjacent States. Removal of about one-half of the upper crown canopy by cutting resulted in a ninefold increase in annual twig growth the first year. In subsequent years, topped shrubs outproduced control shrubs but at a declining rate. Field tests revealed that topping could be accomplished about twice as rapidly by using lightweight chain saws instead of lopping shears. By the chain-saw method, at $3 per man-hour, costs varied from $7.20 to $16.80 per acre.

Deer Browsing Affects Hardwood Regeneration

In northern hardwoods, simulated browsing of seedlings for 5 years showed that black cherry was least able to maintain good form even under low intensities of clipping. The form of white ash, sugar maple, and red maple was less affected. Survival rates were high in all species at all levels of clipping. However, the effects of heavy deer browsing can be serious because any delay in stand establishment adds to the rotation period and trees of the most desirable timber species may not grow out of the reach of deer.

Bitterbrush for Cattle and Deer

Although deer and cattle in drier areas of the West do not compete directly for bitterbrush forage because they are not on the same area simultaneously, cattle use should be carefully controlled to avoid overuse of the bitterbrush. Trials in central Oregon with known numbers of deer in large fenced areas showed the stocking rate for winter grazing to be 31 deer-days per acre based upon the criterion of 60 percent use of bitterbrush leader length. Concurrent trials of spring grazing by cows showed a stocking rate of 9.5 acres per arrival unit month at which time they had used 40 percent of the bitterbrush and only 25 percent of the grasses. Seven additional days of grazing achieved the goal of 40 percent use on the grasses but increased the use of bitterbrush to 85 percent which is usually too heavy for this very important browse.

INTERNATIONAL FORESTRY ACTIVITIES

The international forestry activities of the Forest Service involve technical assistance and training in foreign aid programs, preparation for and exchange of information in meetings of international organizations, translation of important scientific documents, preparation of forest resources reports for specified areas of the world, and representing the Department of Agriculture in development of the U.S. part of the international Water for Peace program.

Training Foreign Nationals

The Foreign Training Unit prepared or assisted in the preparation of 103 training programs or study tours for 252 foreign nationals from 38 countries. In addition, three refresher programs were prepared for Forest Service Participating Agency Service Agreement (PASA) employees in the United States on home leave.

Of the 103 programs prepared for foreign nationals, 43 were sponsored by the Agency for International Development (AID) and included a total of 73 participants. Programs for 19 people were sponsored by the Food and Agriculture Organization (FAO) of the United Nations. The remaining 41 programs involving 160 people, were sponsored by the individuals themselves, by their employers and governments, by international foundations, or by the U.S. Department of State through its educational and cultural exchange programs.

Of the total 252 participants, 87 came to the United States under individual programs and 165 came as members of 16 teams or short course groups of from 2 to 40 members. Included in the latter were an 8-week special Tropical Forestry Short Course (in Spanish) for 12 men from the Dominican Republic; a short course in Administration of National Parks and Equivalent Reserves for 40 participants; a 36-week program in watershed planning for seven Turks; a 3-week program in Forest Resource Management for 10 multicountry participants; and a 6-week special training course in Range Management and Forage Production for 14 men.

Ninety-three participants trained in general forestry, 62 in forest products utilization and engineering, 40 in forest management, 41 in watershed and range management, five in forest protection, and 11 took part in a variety of study areas such as forest inventory, statistics, forest economics, forest genetics, administrative management, and forestry extension.

Eighty participants came from countries in Asia, the Middle East, and Pacific Islands; 72 from Europe and Canada; 76 came from Latin American nations; and 24 were from Africa.

During the period, 53 foreign nationals were assigned to various U.S. colleges and universities for academic training in forestry and related fields. This brought the total current academic enrollment of foreign nationals programed by the Foreign Training Unit to 89.

Technical Consultation and Support

The Washington Office of the Forest Service continues to be the focal point for providing assistance to foreign countries and to U.S. foresters serving overseas. More than 800 requests from scientists and professional workers in 50 countries were received and serviced in this office during 1967. These requests were for: (1) Advice on technical forestry problems, (2) forest tree seed, pollen, or cuttings, and (3) publications and technical materials.

During 1967, 35 Forest Service people were on assignments of 1 year or more with FAO and AID in 20 countries. Ten of these returned to the Forest Service during the year, after completion of their assignment. Nine of the 35 were recruited and departed to their foreign duty posts during the year. The remaining 16 served throughout 1967.

Eight Forest Service scientists accepted and completed short-term consultant assignments for FAO and AID missions in eight foreign countries. They rendered technical assistance varying from preparing watershed development plans and instructing in the testing of wood to advising on research needs and completing dendrological studies.

During 1967, the Forest Service recruited, trained, and assigned five men to the USDA/PASA team in Vietnam, making a total of seven Forest Service personnel presently serving as members of USDA/PASA teams in three countries. A

PASA is an agreement between the Agency for International Development and another agency to provide technical assistance.

International Organization Activities

The Congress of the International Union of Forest Research Organizations (IUFRO), met in Munich, Germany, September 3–9. More than 800 research directors and scientists from the leading forest research institutes of 56 nations were participants in this Congress. Technical sessions covered latest research findings and activities of IUFRO working groups in 13 different subject matter fields. These were followed by field trips to view forestry research and action programs in Germany. Dr. George M. Jemison, Deputy Chief for Research, Forest Service, was elected President of IUFRO for the coming 5 years. Forest Service scientists were also elected chairmen of the sections on forest botany and forest products research.

The Fourth Session of the FAO-North American Forestry Commission met in Mexico, D.F., October 2–7. Pre-Commission working groups on tree improvement and on wildlife and recreation held meetings during the week preceding the Commission session. Working group reports were also received on forest fire control, forest insect and disease control, forestry education, forestry equipment, and tropical forestry development. These meetings are held periodically for the exchange of knowledge in areas of common interest, such as control of pests and joint improvement in forest fire protection in border areas.

The FAO Latin American Forestry Commission met December 4–9 in Port-of-Spain, Trinidad-Tobago. Thirteen countries were represented along with seven international organizations. A summary report of a survey of forest research institutions and facilities in Latin America was reviewed. This resulted in the Commission reestablishing the Regional Committee on Forestry Research. The Committee will work on wood technology, timber marketing, lumber grades, silviculture and genetics, watershed management and erosion control, and volume and yield tables. Management of forests for multiple-use purposes was stressed throughout this session of the Commission. The Secretary of Agriculture for the Commonwealth of Puerto Rico, Mr. M. A. Hernandez Agosto, was elected first vice-chairman of the Commission.

The first session of the FAO Committee on Forest Development in the Tropics met in Rome, Italy, October 18–20. At this organizing meeting, it was determined that the first major function of the Committee would be to review the biennial programs of the FAO and to recommend to the director-general ways in which work in tropical areas of the world could be strengthened.

Forest Service representatives also participated in the following important international conferences: (1) FAO Committee on Wood-Based Panel Products, Rome, Italy, December 12–14, 1966; (2) a world Symposium on Manmade Forests, Canberra, Australia, April 14–25, 1967; and (3) the 14th session of the FAO Conference, Rome, Italy, October 23 to November 3, 1967. The Society of American Foresters and the Canadian Institute of Forestry held a joint meeting in Ottawa, Canada, October 15–19, 1967.

Translation Services

International Forestry Staff processed and made available translations of 17,286 pages of foreign language scientific and technical publications into English under the Special Foreign Currency Science Program. Of these, approximately 2,500 pages were of primary interest to the Forest Service and forestry. The completion rate of translations from Israel decreased for a time during the Middle East conflict but shipments were resumed about September 1.

Additional services were provided by arranging for translations of 410 pages by the Joint Publications Research Service, Department of Commerce, and by local translators. These translations were made on requests from the Forest and Range Experiment Stations and the Forest Products Laboratory.

Copies of all translations were distributed to the Stations, the Laboratory, the Institute of Tropical Forestry, and the National Agricultural Library. These translation services have also been offered, through cooperative agreements, to schools of forestry. Forestry schools at Michigan Technological University, University of Montana, North Carolina State University, Oregon State University, Stephen F. Austin State College, and Yale University are participating in the translation program.

Water for Peace

A member of the Forest Service, working under the direction of the Assistant Secretary of Agriculture for Rural Development and Conservation, gave leadership to the Department of Agriculture's activities in the U.S. Water for Peace program. A program on Water for Peace was prepared and printed in the form of a report to the President. One phase of the program included an International Conference on Water for Peace which was held in Washington, D.C., May 21–31, 1967. The Conference was attended by 3,000 registered participants from 94 nations of the world. Water in relation to forestry, food, and agriculture was discussed at many points throughout the Conference and many useful approaches to the problem of assuring an adequate supply of pure water were exchanged.

In opening the Conference, President Johnson announced the establishment of the Office of Water for Peace in the Department of State. A member of the Forest Service, assigned to the International Forestry Staff, serves as the Department's liaison officer with the Office of Water for Peace.

FORESTS COVER ONE-THIRD of the land in the continental United States. More than 70 percent of the commercial forests are owned by private citizens. The Forest Service cooperates with State agencies, private forest owners, processors, and rural community planners and developers to (a) protect 450 million acres of State and privately owned forests and watersheds against fire, insects, and disease; (b) encourage better forest practices for multiple use management and profit on the 367 million acres of private forest land; (c) produce genetically improved forest tree seed; (d) produce planting stock for forests and shelterbelts; (e) stimulate development and management of State, county, and community forests; (f) assist forest product producers and processors in improving quality and quantity of their output; and (g) provide a better livelihood for rural people.

Cooperation—State and Private Forestry

Toledo Products, Inc., has created a new payroll for Lincoln County, Oreg. This is an industry manufacturing a variety of wooden items on a continuing basis throughout the year.

It all started in 1961, when Dr. Matthew Gruber of Toledo became aware of the plight of older and handicapped people. Seeing waste lumber, edgings, and slab from the local sawmill being burned, he discussed with local foresters and community leaders the possibility of making toys and small commercial items out of it. This resulted in the formation of a corporation by five community leaders. From this nucleus the board of directors grew to 10, three being employees in the plant. Preferred stock was sold to any one who did not work in the plant, and common stock was sold only to workers.

The board formulated the objectives to meet the human need and opportunities prevailing. They are: (1) To promote employment and welfare of elderly, handicapped, and retired people; (2) to make use of the industry and skills of these people to improve the local economy; and (3) to promote the use of wood and its related products by manufacture and development of such products. State and Federal Forest Service members of the county Technical Action Panel and the county RAD group assisted in organization of the corporation and the development of the objectives.

Mr. Francis Woods, himself a retired sawmill worker and millwright in eastern Oregon, was recommended by the local forester and hired as manager—a job he has held from 1962 to the present.

The county Technical Action Panel assisted in securing the rental of an old boathouse as a factory. Dr. Gruber's DeWalt-radial-arm-saw was the original and only piece of machinery when operations were initiated. The toy idea was dropped when an order for pallet boards was accepted from the nearby paper division of the Georgia-Pacific Lumber Co. Foresters found other orders for shingle band sticks and grape stakes. The initial pallet boards were so good that Toledo Products, Inc., was able to obtain much larger orders. Employment increased from the original 6 to 10, and 2 years later a total of 34 were employed.

Additional machinery such as bench saws was acquired as funds and opportunity permitted. In 1964 the original building proved too small. The county TAP and RAD group helped find larger quarters in an old county highway shop on the railroad. Purchase was made through an SBA loan. From the start, the county RAD group, including their forestry advisors from the U.S. Forest Service and the State Department of Forestry, took a vital interest in this enterprise. This resulted in securing local support by townspeople purchasing preferred stock and in securing needed equipment and markets for their products. They continue to check with the manager to offer help.

The average age of all employees is 67 years. They own up to $100 worth of common stock each. Stock purchases are limited to spread control.

Most of the raw material is low-grade Douglas-fir lumber. The bulk of the business is still pallet boards, but other items such as grape stakes, band stakes, survey stakes, and lawn furniture are made.

This is only one example of how the State and Private Forestry arm of the U.S. Forest Service helps rural people and communities sparks initiative in rural development through better utilization of our forest and human resources. Behind this assistance is the technical know-how and the many resources of the Forest Service in close working relationship with State Foresters and their State and federally financed Service Foresters. This assistance reflects the recognition that healthy, well-managed, and productive public and private forest resources are essential to the well-being of the economy and the people, both nationally and locally.

RURAL COMMUNITY AND AREA DEVELOPMENT

Forests provide the resources and raw materials for new jobs and increased incomes in many rural areas, thus strengthening the economy. A prime objective of the Forest Service, working with State Foresters, is to help stabilize the population of rural areas by increasing the number of available jobs. In many communities, wood-processing plants and forest-based recreational and other enterprises are helping to achieve this objective.

Employees of the Forest Service and State forestry representatives serve on Technical Action Panels in every State to provide forestry assistance and advice to local development groups of all kinds. During 1967 the Forest Service reviewed and reported on 882 rural development projects; provided special assistance to 278 local development groups and 53 forestry cooperative ventures; and serviced more than 328 special loan, study, training, and development projects.

FLOOD PREVENTION AND RIVER BASIN PROGRAMS

The Forest Service carries out flood prevention and watershed protection activities under several programs: The Flood Control Act of 1944, pilot watershed projects authorized in 1954, and the Small Watershed Program under Public Law 83–566 as amended. In assisting with, planning, or carrying out forestry measures under these programs, the Forest Service cooperates with local project sponsors, the Soil Conservation Service, State Foresters, and other Federal, State, and local agencies. It acts directly to apply emergency flood prevention measures on non-Federal and national forest lands. The Forest Service also cooperates with other Federal agencies and State governments in comprehensive river basin studies for the development of water and related land resources.

Flood Prevention Projects

In Mississippi 500,000 acres of severely eroded land in the Yazoo-Little Tallahatchie Flood Prevention projects have been stabilized by planting pine trees. Many of these plantations are now reaching merchantable size. To make use of this source of raw material, U.S. Plywood-Champion Paper Co. is building a flakeboard plant at Oxford, Miss.

"This is 'Resources in Action'," Secretary Freeman declared June 27, at the ground-breaking ceremony to dedicate this plant. He pointed out that the plant ". . . will use products of the land to improve the economy of this part of America . . . it symbolizes what I have been talking about and working toward ever since I became Secretary of Agriculture."

The new plant is planned for completion within 2 years. It will use about 130,000 cords of pulpwood annually, a major portion of which will be purchased from private ownerships within the Yazoo-Little Tallahatchie area.

"Resources in Action can succeed only when the local people want such a program," the Secretary stated in his dedication remarks, "and only when they turn to, get organized, summon up all the forces of their communities, and then coordinate and use effectively, through cooperative planning and operations, the help of State and Federal agencies and programs. Here, this has been done . . .

"Some of your accomplishments are truly amazing . . . Most significant, for it ties directly into the reason for this new wood-using plant and its job for local people and the money that woodland-owners will receive from their tree crops, is the fact that about 500,000 acres of new forests have been planted . . ."

Forestry installations for flood prevention purposes were continued on seven flood prevention projects authorized under the Flood Control Act of 1944. Over 32 million trees were planted in stabilizing 24,000 acres of critical flood and sediment source areas. This reforestation resulted from the combined efforts of the Forest Service, Soil Conservation Service, Agricultural Stabilization and Conservation Service, Corps of Engineers, local soil and water conservation districts, and landowners.

Approximately 2,871,000 acres of potential flood source lands continued to be protected from disastrous fires. This protection was strengthened by the construction of 507 miles of fire control roads, trails, and firebreaks, and 10 additional buildings for housing fire crews. Additional fire suppression equipment was installed in critical areas of high fire hazard. Other flood control measures included stabilization of stream channels by installing 71 grade stabilization structures and 3.6 miles of channel improvement.

Flood prevention works of improvement were installed on about 33,600 acres of private forest land. This consisted principally of improved watershed management which includes tree stand manipulation, and stabilization of sediment-producing skid trails and log roads. Technical assistance was provided to over 4,000 landowners and operators.

Emergency flood prevention treatment was applied on two southern California areas. About 2,900 acres were completely denuded of protective vegetal cover by devastating forest fires. These burns were potential sources for flood and debris which threatened high-density urban and rural property, utilities, irrigation, and domestic water supplies, several hundred acres of citrus groves, cultivated land, and county and State highways. The areas were stabilized by seeding to grass, stabilizing truck trails, cleaning out debris basins, and channeling debris runoff from frontal canyons.

Public Law 566 Projects

Watershed protection and flood prevention projects are authorized under the Watershed Protection and Flood Prevention Program of 1954 (Public Law 566). Local groups receive planning, technical, and installation assistance from Federal agencies under the general leadership of the Soil Conservation Service.

During 1967, the Forest Service worked with the Soil Conservation Service and local sponsors in planning watershed protection and flood prevention improvements on 138 small watersheds. Work plans were approved and installations authorized on 88 new projects; 69 of these include accelerated programs for improvement of forest lands.

Forestry measures were installed on 343 projects. About 16 million trees were planted on privately owned land within watershed areas. Technical forestry assistance for installing the measures on private land was provided by the Forest Service in cooperation with and through the State Foresters. Assistance was provided 3,860 landowners involving 186,000 acres. Protection from forest fires was extended or strengthened on 341,000 acres. Other watershed improvements include treatment of over 126,000 acres for forest stand manipulation measures, about 23,000 acres protected from grazing, and 15 miles of eroding skid trail and logging roads stabilized.

Public Law 566 improvements on national forest lands included revegetation of 5,740 acres by tree planting or range and grass seeding; treatment of 2,960 acres with contour furrows, trenches, or terraces; 20 miles of roadside erosion control; and installation of 59 grade stabilization structures.

RIVER BASIN PROGRAMS AND INTERAGENCY COORDINATION

During the year the Water Resources Council, established under Public Law 89–80, became fully operative in its functions of guidance and coordination of the Nation's water and related land resource planning activities.

The Forest Service, in cooperation with the Soil Conservation Service and Economic Research Service, participated in a wide variety of actions by committees of the Council, including the development of guidelines, standards, coordinated budgets, and review procedures.

Substantial contributions were provided through the Council's staff to the First Biennial National Assessment of Water Resources under section 102 of the act. The Forest Service led in the development of the Wilderness Section and developed much of the Watershed Land Management Section. The study will be completed in mid-fiscal year 1968 and will provide an up-to-date analysis and evaluation of the adequacy of water and related land resources of the United States.

During the year the Forest Service was engaged in eight type I—Comprehensive Framework Studies; 14 type I—Detailed Comprehensive Studies; 19 type IV—Cooperative studies, and the special Appalachian Water Resources Study. Five studies were completed—the Ohio type I, and the Genesee, Pascagoula, Sabine, and Big Black (type II studies).

In addition, 37 specific project reports and plans of the Corps of Engineers and Bureau of Reclamation were given detailed review and analysis as to effects and impacts on forest resources and programs of the Forest Service.

FOREST PEST CONTROL

Insect Control

Forest insects continued to be a major source of drain on the Nation's timber resources, but the number of devastating outbreaks was lower than that of a few years ago. The mountain pine beetle continued its relentless attack in the old-growth lodgepole pine stands on the Targhee and Teton National Forests in Idaho and Wyoming despite major efforts to control it. Southern pine beetle also was destructive in Alabama, Louisiana, Mississippi, North Carolina, South Carolina, and Texas. Recent evaluations of control efforts give hope that timely salvage logging, cutting and burning, or cutting and chemically treating infested trees is resulting in marked reductions of this bark beetle in all southern States.

A Douglas-fir beetle outbreak in northwestern California, triggered by a 1964 blowdown and flood, appears to have passed its peak. A gross volume of 788 million board feet of Douglas-fir was killed. However, salvage sales in infested areas have recouped much of the timber killed on the 1,600,000-acre affected area.

In June, a sudden outbreak of ips beetles threatened valuable pine plantations on the Bessey District, Nebraska National Forest. Job Corpsmen, National Guardsmen, personnel from other na-

tional forest, and local labor were quickly mustered to quell the outbreak.

Little control of defoliating forest insects was undertaken in 1967 since they were not causing sufficient damage to warrant suppressive action. Spruce budworm, one of the most serious, was controlled on 92,000 acres of State and private lands in Maine by an aerial application of 1 pound of DDT per acre. A 500-acre portion of the infestation was used to test the effectiveness of a promising nonpersistent pesticide under eastern conditions.

A lindane emulsion was used to control balsam woolly aphid on 500 acres of Fraser fir on Roan Mountain in the Appalachians along the Tennessee-North Carolina State line and on 35 acres of the same type in Mount Mitchell State Park in North Carolina. A shortleaf pine seed production area on the Piney District, Ozark National Forest, was sprayed by helicopter with formulations of BHC and carbaryl to evaluate their effectiveness in controlling coneworms and seedworms. In New York, 340,000 white pine terminals were sprayed with 1 percent lindane to control white pine weevil. Other small projects were conducted at various places throughout the Nation to control minor outbreaks of beetles, weevils, aphids, sawflies, budworms, leaf rollers, and cankerworms.

Disease Control

In 1967 further evaluations were made of the blister rust control program in the native ranges of eastern white, western white, and sugar pine. Evaluations in north Idaho, western Montana, and eastern Washington revealed that blister rust was infecting young western white pine stands in protected areas at an average rate of 3 percent per year. It was decided to curtail ribes eradication in these areas because there is no longer hope that it will be economically feasible to bring these young stands through to merchantable size.

However, ribes eradication is being continued in all sections of the Nation where this method of control (eliminating the alternate host) has proven effective, necessary, and economically feasible for white pine production. A total of 7.8 million gooseberry and currant plants on 150,000 acres were destroyed either by hand pulling or spraying with herbicides to prevent further spread of blister rust. In Michigan, Minnesota, New York, Oregon, and Wisconsin, blister rust cankers were pruned or excised from 1,268,000 trees. Blister rust control has been established on 91.8 percent of the 15-million-acre control area in the East and Lake States. Control in these areas can be maintained by periodic removal of the ribes.

Dwarf mistletoe control work was performed on national forest lands in Arizona, California, Colorado, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming. Much of the suppression work was performed in conjunction with timber sale and silvicultural operations. A total of 331,000 infected trees was cut or pruned on 34,000 acres. In California three field work conferences were conducted during the year to acquaint national forest, national park, and State forestry personnel with the various aspects of dwarf mistletoe detection, evaluation, and suppression.

The Federal-State cooperative oak wilt control programs were continued in Pennsylvania, Virginia, and West Virginia, and cooperative surveys were conducted in Arkansas and North Carolina to determine infection trends. A total of 45 million acres was covered by aerial surveys and 7,836 infected trees were deep-girdled or cut to eliminate sources of inoculum. Study plots, established in Pennsylvania and West Virginia to evaluate the effectiveness of control by methods being used in these States, were reexamined.

Several small projects for control of the root rot *Fomes annosus* by treating freshly cut stumps with urea or borax were carried out on State lands in New York and on the Clark National Forest in Missouri. Root diseases are causing forest resource managers more and more concern. New centers of destructive root diseases were found throughout the State of California.

Other Control Activities

The effort to find safe and effective substitutes for DDT to suppress forest defoliating insects was continued during 1967. Results of tests increased hopes that a safe and selective insecticide can soon be recommended for control of the perennially troublesome spruce budworm.

Detection and evaluation surveys were a most important segment of pest control activities. A total of 480 million acres was examined by Federal and State pest control people both from the air and on the ground to keep abreast of the ever-changing situations. This emphasis on early detection appears to be paying worthwhile dividends.

COOPERATIVE FOREST FIRE CONTROL

Data and charts covering all forest fires in the United States for the period of 1917 through 1966 were included as a supplement to the annual report on Forest Fire Statistics issued by the Forest Service.

In this 50-year period, forest firefighters suppressed about 7 million fires which burned over a billion acres. The greatest forest fire disasters and the most acres burned were in 1930 and 1931 when over 50 million acres were burned each year.

The number of fires has increased from 38,303 in 1917 to 122,500 in 1966. About two-thirds were caused by man. The major causes of forest fires during this period were: (1) Incendiary (26 percent), (2) smoking (19 per cent), and (3) debris burning (18 per cent). The number of incendiary fires has increased sharply during this 50-year period. In 1966 the number of incendiary fires had increased sixfold over 1917.

As of July 1967, a total of 480 million acres of State and privately owned land was being pro-

tected under section 2 of the Clarke-McNary Act. Between January and July 1967, 67,086 fires had been reported and a total of 1,288,547 acres of protected State and private forest land had burned. The final reports for calendar year 1966 reveal that 98,157 fires burned 1,908,236 acres of protected State and private lands. Debris burning and incendiary fires accounted for most of the forest fires in the United States.

Airplane patrols for forest fire detection have proven successful, and air detection has been expanded. The total number of airplanes used by all State Forestry Departments now constitutes one of the largest nonmilitary fleets in the Nation.

There has also been a marked increase in the use of air tankers and helicopters for fire suppression by many State forest fire control organizations.

COOPERATIVE FOREST FIRE PREVENTION

Smokey Bear's messages for television viewers were distributed in full color during 1967 for the first time. Color films, placards, and slides were sent to more than 700 television broadcasters in March. One of these filmed announcements won an American Advertising Federation award as the "Best Individual Public Service Ad" of the year.

Smokey's top award for nationwide achievement in forest fire prevention, the "Golden Smokey" statuette, was presented to the Western Forestry and Conservation Association at its annual awards banquet in Seattle, Wash., December 7, 1967.

Plaques recognizing outstanding service of less-than-nationwide scope were presented to:

J. O. Matlick, Commissioner
Kentucky Department of Natural Resources

California Federation of Women's Clubs—Junior Membership

Roger Pusey, staff writer, Deseret News
Salt Lake City, Utah

Television Station WWTV
Cadillac, Mich.

John F. Nolan, art teacher
Fresno, Calif.

Bernell M. Calderwood, TV personality
Salt Lake City, Utah

A new form of communication with television viewers was tried in 1967. A slide/script feature of 2- to 3-minute length was prepared on the 25th anniversary of the Smokey Bear program, and went to 271 selected television stations. A similar project in October had as its subject "Smokey's Message for Fire Prevention Week."

Outstanding cooperation from newspaper advertising executives around the country resulted in the donation to the Smokey Bear campaign of more than 1,500,000 column lines of special forest fire prevention advertisements. More than 537 daily newspapers ran a series of 13 specially designed advertisements on successive weeks during July, August, and September. The commercial value of this donated space is greater than the total yearly budget for the CFFP program.

A 59-foot Smokey Bear balloon flew in Macy's 1967 Thanksgiving Day Parade, to the delight of millions of viewers across the Nation.

Fees and royalty for Smokey Bear educational items sold commercially produced $36,796 in revenue during calendar year 1967. These funds are earmarked for "furthering the nationwide forest fire prevention campaign," under the terms of the "Smokey Bear Act" of 1952.

The first comprehensive study of public understanding and reactions to the Smokey Bear campaign and forest fires was conducted under the supervision of the volunteer advertising agency, Foote, Cone & Belding of Los Angeles. The study was undertaken in the East, the South, and in California—places where "people problems" are intensified by large population.

Nearly 200 television broadcasters requested and were furnished color prints of a new 3½-minute fire prevention film entitled "Smokey and His Friends." Sample prints were also furnished to regional offices and to State foresters.

COOPERATIVE FOREST MANAGEMENT

The objectives of the Cooperative Forest Management program are to: (1) Insure that private forest resources contribute effectively to our expanding national economy, (2) protect and improve the quality of our total environment, and (3) enhance the economic welfare of woodland owners and others who depend on these resources to make a living.

Through this program the Federal Government shares with the States the cost of providing technical guidance to private woodland owners, loggers, and processors of primary forest products. Assistance is given for multiple-use management, and for harvesting, processing, and marketing forest products.

Owners are assisted in improving, protecting, and managing all of their forest resources—for renewable crops and for other appropriate uses. Loggers and others who harvest forest products receive help in improving their methods and equipment. Processors get assistance in improving their efficiency, product quality, and markets.

The benefits resulting from the program affect the well-being of the landowners, the rural communities in which they live, and the local people who profit from the use of the forest resources. They also affect many others—residents of urban areas and even people who may never set foot on the woodlands.

Benefits come in many forms: wood, and other products of the forest—recreation, clear streams,

protection of downstream values, natural beauty, and a better resource base for the future.

In fiscal year 1967 the Federal share in financing this program was $3,538,000; the States' share was $4,800,000.

During the year, 781 Service Foresters employed by 49 cooperating States, Puerto Rico, and the Virgin Islands helped 108,000 woodland owners. This involved 6,200,000 acres, or 2.3 percent, of the Nation's acreage of privately owned small forests. Gross returns to the owners of these woodlands from the sale of forest products amounted to $22 million. The program helped to create an estimated 4.5 million man-days of employment in rural areas.

General Forestry Assistance

The Forest Service, through its General Forestry Assistance Program, provides professional services to:

1. Foster rural area development through Technical Action Panel representatives, and regional, State, and local economic and resource development groups.
2. Expand markets for forest products in support of rural area development.
3. Improve forest management, harvesting, and processing practices.

General forestry assistance supplements the various cooperative State-Federal forestry programs for State, local government, and private forest lands, and those with the forest products industry. A wide variety of professional forestry services are provided where such assistance is required. For example, professional personnel supported by GFA funds provide services to States, other USDA agencies, other Federal departments, and to large private landowners and forest industries that cannot otherwise obtain such service.

In fiscal year 1967, GFA personnel provided service to large private forest landowners which included 370 service calls and 4,150,000 acres of forest land; to Federal, State, and local public landowners involving 104 service calls and 10,680,000 acres of forest land; and consultants, organizations, and development groups involving 39 service calls and 2,422,000 acres of forest land.

Also during the fiscal year, technical services were provided to local communities and industries involving economic investigations for 53 cooperatives and associations, seven concentration yards, 32 timber products processing plants, 74 special forest products operations, five forest management complexes, and three timber development organizations (TDO's). Assistance was provided in preparation of 117 special resource inventories, market surveys, and industrial prospectuses.

During the year GFA personnel prepared 74 forestry publications and 14 movie and slide series; actively participated in 160 research and administrative studies and 106 State forestry long-range plans and workload analyses; participated in 229 forestry workshops and program development meetings; provided special services to 223 rural areas committees, Technical Action Panels and forestry cooperative advisory groups; and serviced 310 special departmental forestry loan, study, training, and development projects.

In fiscal year 1967, increased emphasis was placed on Rural Areas Development (RAD) with assignment of "outreach" functions to the department by the President. Forest Service Technical Action Panel (TAP) participation was fortified with added representation and new directives and information.

During the year, forestry cooperative advisory groups in 31 States were provided with guidelines and material to implement their operation. Directives were amended to give direct responsibility for assistance to forestry cooperatives and groups seeking to organize forest cooperatives to State TAP's where no forestry cooperative advisory group has been organized. Plans were developed for three regional forestry cooperative conferences.

Three feasibility studies for timber development organizations were inaugurated in Tennessee, New York, and Kentucky.

The Forest Service furnishes specialized professional assistance on forest products, forest management and protection, forest industries, forest-based recreation, and other forest land uses to the U.S. Departments of Commerce; Defense; Health, Education, and Welfare; Labor; and State. In fiscal year 1967, the Forest Service investigated, reviewed, assisted, and reported on 22 Manpower Development and Training Act proposals; 66 Economic Development Act Industrial Loans and Technical Feasibility Grants; 15 Economic Opportunity Act projects; 9 Vocational Education Act projects; 40 Regional and District Development projects; and 56 Natural Beauty projects.

These activities, together with other Forest Service activities in rural areas development, contribute substantially to the social and economic improvement of rural people and their communities.

Following is an example of assistance given through the GFA program:

> A forest-based industry died some time ago in the little town of Menahga, Minn., population 800. It has been given new life with the establishment of a new forestry cooperative.
>
> The Minnesota Forest Products Cooperative is scheduled to begin making lath and snow fencing in 1968. When in full production, it will employ a dozen men and gross $158,000 annually by present estimates. It will provide a boost to the local economy and a market for wood to be harvested by local farmer members of the cooperative.
>
> The idea was born last spring when Walter Skoog, manager of the Menahga Farmers

Cooperative Store, read an article about the Lake States Forestry Cooperative.

Working rapidly, he and representatives of other local co-ops called for assistance from the Department of Agriculture's State Technical Action Panel and the Minnesota Conservation Department. State forestry and U.S. Forest Service specialists conducted intensive resource, market, and facility analyses and found the project to be promising.

The cooperative was incorporated and funded by a group of local citizens. It then purchased the defunct lath mill in Menahga at a foreclosure sale.

A manager and small crew are now at work getting the plant started. Raw material is being purchased from local people—half from lands of co-op members and the other half from State, county, and other private lands.

Additional assistance in reviving the industry was given by the Farmers Home Administration, North Central Minnesota Rural Conservation and Development project, and the Wadena County Rural Area Development Committee.

Forest Products Utilization

The number of Forest Products Utilization (FPU) personnel increased by 9 to 75 in 1967. Twenty-seven are employed by the Forest Service and 49 (including 11 vacant positions) by State foresters in 37 States. Six more States entered the program.

Two sessions highlighted the training program. One was a 3-week course held at Michigan State University. The other was a 4-week basic sawmill workshop at the University of Missouri's Experimental Forest near Poplar Bluff.

The FPU case history file is steadily growing. Most case histories show extremely favorable cost-benefit ratios for service-to-industry-type activities.

An FPU liaison position was established at the Forest Products Laboratory to provide more rapid dissemination of research information to the field and more efficient feedback of research needs from the field to FPL.

The trend during the past year has been towards more specialization. Both the Northeastern and Southeastern S&PF areas now have several specialists, who work chiefly in the three fields of harvesting, sawmilling and other primary processing, and marketing. Nine of these men (in the two Areas and five State forestry agencies) are funded by the Hardwood Improvement Program.

Technical assistance in logging, processing, and marketing was provided by S&PF specialists to: (1) Timber operators and forest products processors involving 502 service calls; (2) State and local public agencies involving 192 service calls, and (3) Federal agencies and others involving 119 service calls.

Cambridge Consultants, Inc., signed a contract to design an effective system for training hardwood-improvement program and related personnel in Government and in the forest industry to produce the highest log and lumber values through optimum methods of bucking and drying.

Tree Planting

The Cooperative Seedling Production, Procurement, and Distribution Program, set up to establish forest and shelterbelt plantings on State and privately owned lands, accounted for the planting of 70 percent of the million acres planted last year. Approximately 70,000 acres were planted on State-owned forests, and the remainder on privately owned land. Forty-eight States and Puerto Rico cooperate in the program.

Planting by forest industries accounted for about half of the planting on privately owned land. Their nurseries did not fully meet their needs for stock, so they purchased about 150 million seedlings from States and other sources.

Ninety State-owned nurseries produced 627 million small trees that were planted on more than half a million acres. Forest products industries produced planting stock in 26 nurseries. These furnished stock for reforesting about 225,000 acres. A total of 105 commercial forest tree nurseries produced 50 million small trees that were utilized mainly for Christmas tree planting and for shelterbelts. Fourteen States, nine in the South, produced about 80 percent of the planting stock. The States were: Alabama, Arkansas, Georgia, Florida, Louisiana, Mississippi, Minnesota, New York, North Carolina, Oregon, South Carolina, Washington, Virginia, and Wisconsin.

Florida is the leading State in total production of planting stock with shipments that exceeded over 71 million seedlings.

State and private forestry development of genetically improved planting stock continues to expand. Several States have such trees available for sale to individual landowners. This expansion will continue at a fairly rapid rate during the next few years. In 1967, the State of Georgia grew about 7 million improved southern pine seedlings for distribution to individual landowners. This represented about 14 percent of the State's total production of planting stock.

Thirty-seven States participate in the assistance to the State's Tree Planting Program through provisions of title IV of the 1956 Agricultural Act. This program applies mainly to the reforestation work on State- and county-owned forests for the production of industrial wood. About 75,000 acres are involved annually. Eighteen States utilize this program to help develop improved forest tree seeds.

THE FOREST SERVICE is responsible for managing, developing, and protecting 187 million acres of land and its resources in the National Forest System. This includes 154 national forests in 40 States and Puerto Rico, containing 183.2 million acres; 3.8 million acres of national grasslands; and 160,000 acres of land utilization projects. Under multiple use and sustained yield, these lands are administered for their five basic resources: Outdoor recreation, range, timber, water, and wildlife.

National Forest Management and Protection

Manmade reservoirs for municipal, industrial, and agricultural water supply and for flood control are providing water-based recreation to millions of Americans.

These reservoirs, constructed to prevent flood damage, regulate low flows, and to produce electric power, are proving a valuable new outdoor resource. A growing tide of recreationists is surging into these picturesque back country areas for boating, swimming, fishing, and water-skiing. Many of these lakes are managed by the Forest Service, the Corps of Engineers, or other agencies within or near a national forest.

A notable example is the new 12,000-acre Allegheny Reservoir in Pennsylvania, which is providing needed recreation facilities for urbanites as well as greater prosperity and economic stability in rural areas.

Allegheny Reservoir, located mainly in the Allegheny National Forest, was created by the Kinzua Dam, near Warren, Pa. The structure was completed in 1966 by the Corps of Engineers primarily for flood control and the generation of power. The Forest Service agreed to manage the Federal lands around the reservoir, which will ultimately cover 21,000 acres and extend northward into New York State. Eleven million people live within 125 miles of this development.

In 1967, a total of 125,000 recreation visitor-days was recorded at the Allegheny Reservoir. Projected use by 1970 is 300,000 visitor-days.

Similar developments are underway at the Dillon Reservoir in Colorado, the Sam Rayburn Reservoir in Texas, and numerous others. These structures and their attendant facilities demonstrate that foresight and planning by several agencies working together can help meet the requirements of an ever-increasing public demand for recreation.

The many uses of the National Forests are guided by comprehensive multiple-use management plans. These plans result from study and analyses of: (1) The many needs and demands of the American people—local, State, regional, and national; (2) the knowledge and appreciation of the various resources with their interrelationships and potential for development, and (3) the relationship of national forest lands to plans and programs on intermingled and adjoining private and other public lands.

This type of planning and management has been practiced by the Forest Service for many years. It was confirmed by the Multiple-Use, Sustained Yield Act of 1960. The development and use of the many resources is planned and carried out within the requirements of the multiple-use plans.

TIMBER MANAGEMENT

Timber Sales

The volume of timber harvested on national forest land during fiscal year 1967 was 10.85 billion board feet—1.29 billion board feet less than in fiscal 1966. However, a record amount of timber receipts was deposited in the Treasury. Timber receipts amounted to $172.8 million, an increase of $7.9 million over fiscal year 1966.

A volume of 11.65 billion board feet of timber was sold in 23,266 sales. In addition, 845,599 Christmas trees and numerous other miscellaneous forest products such as boughs, greens, ferns, cones, and seedlings were sold in 87,549 sales. A total of 110,815 sales were made in fiscal year 1967 compared with 80,845 made in fiscal 1966.

In addition to the volume of timber sold and harvested, 169.6 million board feet of timber valued at $276,504 were granted free of charge to 92,587 individuals under the Secretary's Free Use Regulations, S–26 and S–27.

Progress in harvesting the allowable annual cut under multiple-use, sustained yield manage-

ment for the past 5 years is shown in the following table:

[Volumes are in billions of board feet]

Fiscal year	Annual allowable cut [1]	Actual volume cut	Percent of allowable cut harvested	Actual volume sold	Percent of allowable cut sold
1963	11.3	10.0	88	12.2	108
1964	12.0	11.0	92	11.7	98
1965	12.0	11.2	93	11.5	96
1966	11.9	12.1	102	11.4	96
1967	12.4	10.9	88	11.7	95

[1] Annual allowable cuts include only sawtimber for national forests west of the Great Plains and in Alaska; and sawtimber and convertible products for national forests in the eastern half of the United States.

Timber Inventories and Plans

New timber management plans were approved for 14 working circles during fiscal year 1967. These plans cover 7,987,000 acres of commercial forest land. In the interest of economy and flexibility of management, 10 small working circles were eliminated and the area involved consolidated into four large working circles.

Reforestation and Timber Stand Improvement

Major reforestation and timber stand improvement accomplishments in fiscal year 1967 are shown in the following table.

Type of work	Financed from—			Total
	Forest land management appropriation	Deposits by timber purchasers	Job Corps and other antipoverty programs [1]	
	Acres	*Acres*	*Acres*	*Acres*
Planted	89,187	114,840	2,524	206,551
Seeded	26,794	23,396	185	50,375
Natural regeneration on prepared sites	6,097	27,580	40	33,717
Total reforestation	122,078	165,816	2,749	290,643
Release	107,241	130,933	311	238,485
Thinning	86,081	91,665	1,838	179,584
Pruning	711	3,259	846	4,816
Total timber stand improvement	194,033	225,857	2,995	422,885

[1] Includes 113 acres planted, 8 acres released, and 175 acres thinned by Neighborhood Youth Corps; 647 acres planted, 20 acres released, and 100 acres thinned by "Operation Mainstream," and 604 acres thinned under title 5 of Economic Opportunity Act of 1964.

Forest Service nurseries at 14 locations produced 106 million trees, and 13 million more grown at State nurseries were planted on national forest land.

Forest Service extractories processed 52,447 pounds of clean tree seed. The seed-bearing cones were purchased largely from local people. An additional 25,992 pounds of clean seed were purchased from tree seed companies.

Seed orchards were established on 299 acres, and 185 acres of seed production areas were established. Work continued on selection and testing of trees for superior genetic qualities and the grafting of approved selections in seed orchards. Work was also started on the genetic improvement of eastern hardwoods. A black walnut seed production area was established in Indiana, and black cherry seed orchards are being established in Pennsylvania and West Virginia. Selection criteria for other important hardwood species are being developed and tested.

Thinning operations were mostly in young conifer stands. Release operations were carried on in young hardwood stands and in young conifer stands overtopped by brush.

Prescribed fire was also an important management tool: 137,013 acres were burned over by controlled fires as a stand improvement measure to destroy undesirable species in the understory of southern pine stands; 8,927 acres to protect longleaf pine reproduction from brown spot disease; and 26,039 acres to remove litter and competition to create a favorable seedbed for natural regeneration.

RANGE MANAGEMENT

The 105-million-acre natural range environment of the national forests and national grasslands provided a home and food for 2,615,000 cattle and 4,785,000 sheep during all or part of the year in 1967. The product from these livestock provided a direct income to the 20,000 rural families which hold permits to graze their livestock on national forest system ranges. These family-size ranching operations provide much of the economic life for over 600 rural communities.

The rangeland environment also provided a home during most of the year for millions of wild animals, provided a regulated flow of high quality water to farms and cities, and yielded benefits of esthetic uplift and physical improvement for the millions of people who visited it.

Major Accomplishments

Some major accomplishments in development and management of national forest and national grassland ranges during fiscal year 1967:

Range allotments analyzed to secure information needed for planning	600
Range allotments under intensive management	4,000
Acres of depleted rangeland revegetated	206,000
Range fences constructed (miles)	1,284
Range water developments for livestock and wildlife	1,266

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Revision of Grazing Regulations and Directives

A proposed major revision of the grazing regulations and directives was completed in 1967. These were reviewed with livestock industry representatives at a national conference in Denver, Colo., October 11–14. The revised regulations and directives give strong emphasis to: (1) Intensive multiple-use resource development and management; (2) cooperative relationships with users, and (3) interagency coordination in economic development of rural areas.

Information to the Public

Three special informational publications about Forest Service range management policies and programs received widespread interest and distribution. One publication presented a historical account and analysis of the legal and taxation aspects of possessory interests as related to grazing privileges on the national forests.

In February 1967, a major talk—"Grazing Policies on Forest Lands, A Look at the Next Twenty Years"—was presented to the American Society of Range Management. This statement of Forest Service grazing policies was introduced into the Congressional Record by Senator Alan Bible of Nevada. Subsequently, an illustrated reprint was prepared in bulletin form. This reprint met with widespread interest and resulted in large orders for reprints, including use of the bulletin as an insert in a national livestock journal.

A new bulletin, "Managing Public Rangelands: Effective Livestock Grazing Practices and Systems for National Forests and National Grasslands" (AIB 315), was issued to assist ranchers and land managers.

Grazing Receipts

Grazing fees in 1967 ranged from 10 cents to $1.88 monthly for cattle and from 3¾ cents to 40¾ cents for sheep. Receipts amounted to $4,183,348.

Forest Service Grazing Fee Study

The Western Livestock Grazing Survey, 1966, sponsored jointly by the Forest Service and the Bureau of Land Management, Department of the Interior, and conducted by the Statistical Reporting Service, was completed. Data analysis summaries were turned over to the land managing agencies beginning in May 1967. Additional statistical analyses are being developed by the Statistical Reporting Service to further define the data.

The Forest Service evaluated grazing market areas throughout the 11 Western States. Each of these market areas represents an area of uniform grazing value. Results of the Forest Service evaluations were discussed with the livestock industry in October. The comments and suggestions offered by the livestock industry representatives will be incorporated into a complete report, showing the findings of the grazing fee study and alternative approaches to establish a new grazing fee structure.

WATERSHED MANAGEMENT

During 1967, increased emphasis was placed on planning to provide more usable water in places of the greatest need. This positive step in rural area development has far-reaching significance.

The Pacific Southwest Survey moved ahead on schedule. Progress continued in establishing barometer watersheds and developing computer programs needed for watershed prescriptions. More water-quality monitoring stations were installed. Our soils analysis program provided requested specific information for resource uses. Impact surveys to provide information to guide integrated use increased in number over previous years. This year also saw the completion of the surface mine survey and report. More emphasis than ever before was given to the management of mining claims and wise use of mineral resources of the national forest system.

Surface Mining Survey

The Forest Service participated with some 15 Federal agencies or authorities in the 2-year study of strip and surface mining operations and their effects in the United States. The Forest Service developed the random sampling survey for 693 sites in the nationwide study and participated in making technical onsite examinations of surface mining and its effects, as well as the effectiveness of rehabilitation measures.

More than 100,000 acres of national forest lands disturbed by mining require varying amounts of further corrective action to obtain soil stabilization, storm water controls, water pollution abatement, access to areas above high walls, and to prevent impairment of beauty. This disturbed acreage includes surface mined areas, prospecting pits, and certain access roads.

The surface mine study also revealed that the greatest contribution by the Federal Government toward reclamation of surface-mined land has been in research. Most research on reclamation of strip-mined land was done by the Forest Service. During 29 years of research and administration of national forest system lands, the Forest Service has developed methods for conducting extensive inventories of mined lands, classification of mined land environments, and the successful establishment of vegetative cover on hundreds of thousands of acres of disturbed lands.

Soils Program

National forest land management plans provide for maximum use of resources with a minimum of impairment to the soils. A knowledge of the soil limitations and capabilities in relation to various management activities and land uses is a basic necessity in developing coordinated land and resource plans.

Soil surveys are a means of stratifying kinds of lands and thereby identifying potential problems so they can be more effectively dealt with in plan-

ning and management. In fiscal year 1967, comprehensive or detailed soil surveys were completed on 2.6 million acres of national forest lands, and reconnaissance surveys on another 4.5 million. Also, a total of 15.3 million acres of detail surveys and 23.1 million of reconnaissance surveys have been completed.

In addition to the soil surveys, specific soil management information was provided to many Forest Service resource managers for detailed planning of such projects as tree planting, timber sales, road location selection, revegetation of depleted rangelands, watershed rehabilitation, recreation developments, and a variety of other highly contrasting land uses, including conversion of vegetation type to increase forage.

Water Resource Program

Eighty-four watershed scientists working on 80 national forests completed hydrologic and/or watershed condition surveys on almost 12.4 million acres of national forest lands during fiscal year 1967.

This included: (1) Reconnaissance-level hydrologic and condition surveys on 10.1 million acres to identify and classify problem areas and to determine and evaluate existing and potential water yield improvement and sediment reduction capacities; (2) specialized watershed condition surveys on 0.9 million acres to provide the information needed to prescribe treatment on specific problem areas; and (3) detailed hydrologic surveys and analyses on 1.4 million acres to provide the basis for comprehensive watershed management plans for municipal and other high-value watersheds.

Information furnished by these surveys and analyses provided the basis for preparing and implementing 95 individual watershed management plans in the rural countryside.

Full establishment of a system of barometer watersheds continues to receive emphasis; to date, 21 have been established. Detailed hydrologic survey and analyses, and installation of essential instruments have been completed on 10 of these watersheds.

Availability of adequate water is important to rural America's growth. Every acre in the national forest system is important in water production. We are now evaluating surface water yields in 96 watersheds to determine the effects of forest land uses on the environment, to aid in designing protection requirements needed, and to measure hydrologic capability of these representative watersheds to meet long-range needs.

Several new computer programs were developed to facilitate handling of the mass of data being collected on the barometer watersheds and on the hydrologic surveys. These include programs for converting data on water inventory, water quality, and precipitation, streamflow, and climatic stations into usable form. Analytical programs compute water balances and make sediment calculations. Additional computer programs to permit storage and retrieval of soils- and water-use data are now being tested and should be operational soon.

The water balance and sediment calculation programs have proven extremely valuable in a reconnaissance-level hydrologic survey and analysis begun early in 1967 in the Southwest. This scientific investigation is being made to determine capabilities for increasing water production and for reducing sediment yields from national forest system lands tributary to the water-short Southwestern United States. It will eventually cover 40 million acres on 41 National Forests located in the States of Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming. These include most of the important water-producing lands in the Southwest. Management of national forests can have major effects on many elements of existing and future water development within this area.

The hydrologic survey and analysis is being made by teams of experienced scientists in soils, ecology, and hydrology. It is designed: (1) To identify and map areas suitable for water production management; (2) to locate areas of accelerated erosion; and (3) to predict increases in water yields and reductions in sediment which may be possible through scientifically prescribed treatment programs. The final report will include an economic evaluation of the benefits and costs for the water yield improvement and sediment reduction programs. The report is expected to be available by the end of 1968.

Restoring Damaged Watersheds

This year saw the completion of one major restoration program. In the Shasta-Keswick Reservoir area of northern California, copper smelter operations in the early 1900's denuded large areas on the steep hillsides of the Sacramento Basin and caused deep gully erosion. The planting of trees and shrubs and the construction of check dams on this area has been completed after 21 years of effort. Siltation has been materially reduced, and the planting soon will restore the scenic qualities typical of the surrounding timber and brushlands.

Special treatments to remedy bad watershed conditions caused by wildfires continued. Emergency measures were applied after 30 fires involving 51,000 acres had posed flood and sediment threats to downstream areas.

Accomplishments in healing the land and to protect water quality of streams and lakes, although not always apparent in day-to-day observations, are significant when viewed over a year's time. This is especially true for work on land that has long needed major rehabilitation.

In fiscal year 1967, Forest Service crews treated and stabilized 60,000 acres of sheet-eroded and deteriorated areas. More than 150 miles of eroding streambanks, shorelines, and gullies were intensively treated, with benefit to over 2,500 miles of

headwater streams and shorelines. In addition, 1,500 miles of abandoned but actively eroding old roads and trails were stabilized. This work is helping to improve water, land, and timber in the rural countryside.

Water Pollution

A system for continual review and surveillance of the effect of Forest Service activities on high-quality water resources within the national forest watersheds was expanded so that the quality of the resource can be maintained or improved. Twenty additional water-quality monitoring stations are being installed near watershed outlets in a stream, lake, or pond, a water-bearing formation, and a groundwater spring. These stations will identify the significant physical, chemical, biological, bacteriological, radiological, and esthetic characteristics of the water resource. In addition, at 131 sites we are periodically observing conditions and collecting samples for analysis of selected water-quality criteria to guide management and use of watershed lands.

Protection of Resources

As part of the effort to make rural areas more attractive to industry and people—through creating more jobs and opportunities in the country—16 miles of new railroad were constructed under special use requirements in the Clark National Forest of Missouri. Existing or potential water pollution and soil erosion sources were identified and watershed protection requirements were prescribed for the construction and maintenance of the railroad. This demonstrated that advance planning can result in good levels of soil stability and the preservation of water quality, while improving the economy of rural America.

Air Pollution

The Forest Service recognizes that clean air is an essential element in building a better environment for America. Under cooperative agreement we are now monitoring quality of the air resource in a section of Missouri where intensive mineral development is under way. This is to help make sure that commercial development programs will recognize and protect the timber, fish, wildlife, recreation, and esthetic values associated with national forest system activities.

Water Use Requirements

The Nation's forests, farms, and industries require large quantities of water to feed, clothe, and house people. The impacts of rising population on fixed resources of water, land, and open space will determine the course of future events. In western regions, inventories of water use requirements where the reservation principle is applicable continued through 1967. Two regions have developed automatic data processing systems for quick retrieval of data on water uses. This is a preliminary step to a hydrologic analysis necessary to evaluate the outlook for sufficient water in the future.

Impact Surveys, Facilities, and Land Treatment

Impact surveys delineate the effects of reservoirs or other water resource development projects upon the protection, administration, and management of national forest system lands. They also determine the effects of such projects on forest users and permittees, and on the local rural community economy and environment. They provide the basis for recommendations concerning replacement, mitigating, and enhancement measures, and they identify national forest resource management opportunities which will contribute to or enhance project purposes. Reports, based on impact survey facts, are made available to a construction agency to aid in preliminary project planning.

Prior to and during the construction period, a Forest Service liaison officer is provided to work with the construction agency. Some of the direct local and national economic and social dividends derived from this program are: (1) Protection of the land and resources, including appropriate attention to natural beauty and water quality; (2) minimizing interference with regular protection and management activities; and (3) facilitating construction agency operations. In fiscal year 1967, impact surveys were made and/or construction liaison was provided on 175 projects.

To provide for optimum use of water development projects within and adjacent to national forest system lands, the Forest Service, in cooperation with construction agencies, provides and administers facilities for public access and use on and adjacent to project reservoirs. In fiscal year 1967 such facilities were provided at 19 separate projects.

To achieve the full potential of water development projects frequently requires specifically prescribed treatment of tributary national forest system lands. Such treatment, by design: (1) Minimizes reservoir siltation; (2) beneficially affects the quality and quantity of water inflow to the reservoir; and (3) results in the enhancement of scenic and other public use values.

In addition to the tributary land treatment program, reservoir sweeping and debris removal reduces shoreline maintenance costs, increases reservoir use, and provides a safer and more esthetic environment for the public. During fiscal year 1967, tributary land treatment measures were applied and/or reservoir sweeping and debris removal was provided at 22 projects.

Minerals Management

Minerals management activities significantly increased over the previous year. Awareness of minerals as a resource to be managed is evident in cooperative planning for two large mines which went into production on national forest system lands. Prospecting activity was begun in several wildernesses. Occupancy trespass cases received increasing attention, and applications under the Mining Claims Occupancy Act reached a new

high. Income from mineral leasing on acquired lands increased more than $300,000 over last year's receipts.

Mining Claims

A total of 1,453 mining claims was examined for compliance with the mining laws during fiscal year 1967. In addition, management of surface resources was conducted on 3,885 claims covering over 75,000 acres.

There were 86 patent applications, involving 599 claims, pending at the close of calendar year 1966. Actions on 341 claims were completed during this period; 26 claims (12 applications) aggregating 505 acres were recommended for patent during the calendar year.

Surface rights determination is limited to ascertaining the validity of individual claims. One new area was approved for determination on the Deerlodge National Forest. This consisted of several scattered tracts, aggregating 15,000 acres, which were received by exchange.

As of December 31, 1967, the 11-year surface rights determination project had produced the following results:

Acres completed	Number of claims on verified statements	Withdrawn from verified statements	Asserted rights not upheld	Asserted rights valid
117, 829, 824	13, 371	9, 987	1, 302	2, 129

Action in compliance with the Church-Johnson Mining Claims Occupancy Act continued with particular emphasis in the California Region. As of July 1, 1967, a total of 271 cases involved national forest system lands. Of these, 107 were received during the fiscal year. Of the 42 cases completed, fee title was offered in 16 cases, a lease offered in 14 cases, three were issued Forest Service special-use permits, and nine were rejected because applicants were not qualified.

In addition, 516 geologic investigations in connection with land exchanges, recreation areas, road construction, bridge location, and damsites were conducted, which involved nearly 83,000 acres.

Mineral Leases and Permits

There are nearly 19,000 mineral leases and permits on about 16 million acres of national forest system lands. There are 227 propecting permits which are estimated to cover nearly 1 million acres. Included are 15,350 oil and gas leases, of which 8,760 are on public domain forest land and 6,590 on acquired lands. Leases for other leasable minerals total 297, with 177 on public domain lands. Hardrock leases on acquired lands aggregate 267. There are 1,750 leases for mineral materials, with nearly 1,200 on public domain forest land. There are 865 mineral reservations and rights outstanding, aggregating over 190,000 acres, which are being operated.

Total revenue from mineral leases and permits on national forest system acquired lands amounted to $4,063,839 in fiscal year 1967. In addition, it is estimated that nearly $20 million in revenues were received from rents and royalties for leases on national forests and national grasslands reserved from the public domain.

Subsurface Gas Storage Agreement

On January 1, 1967, a new underground gas storage agreement went into effect on lands of the United States in the Manistee National Forest, Michigan. Natural gas has been stored under these lands for over a decade. However, negotiations recognizing the rights of the United States have only recently culminated in agreement between the parties. The agreement grants Michigan Consolidated Gas Co. exclusive storage rights for a period of 50 years. Surface use is subject to the consent of the Secretary of Agriculture.

OUTDOOR RECREATION

New Facilities

As recreation use increases on the national forests, it is matched by a continuing demand for all types of recreation facilities. Much of the recreation on the national forests is dispersed to roads, trails, streams, woodlands, and beautiful scenery. However, other activities such as camping, picnicking, boating, swimming, and winter sports require developed sites where the health, safety, and enjoyment of visitors can be assured.

To accommodate an increasing number of visitors, the Forest Service developed 142 new campgrounds and picnic sites during the fiscal year. Each site normally includes grouping of facilities such as tables and benches, fire grates, parking spots, trash containers, tent spots for camping areas, and water and sanitary facilities. With a planned capacity of four or five persons for each unit, national forest campgrounds and picnic areas can now accommodate safely about 490,000 persons at one time.

Facilities for camping are generally spaced three or four per acre in groups of 15 to 30. The following table shows the increase in the number and capacity of campgrounds and picnic sites during the fiscal year.

CAMPGROUNDS AND PICNIC SITES

	June 30, 1966	June 30, 1967	Increase 1966–67
Number of developed sites	7, 554	7, 696	142
Area occupied (acres)	42, 344	43, 760	1, 416
Capacity, persons at one time (PAOT):			
Camping (PAOT)	373, 080	381, 905	[1] 8, 825
Picnicking (PAOT)	105, 608	108, 548	[1] 2, 940
Total, camping and picnicking (PAOT)	478, 688	490, 453	[1] 11, 765

[1] Includes expansion of established sites.

Other Developments

Camp and picnic areas include most of the more familiar types of national forest recreation facilities, but other areas also require intensive development. These include ski and winter sports areas, organization camps, resorts, swimming sites, boat-launching ramps, and similar areas. Such facilities are installed or improved with appropriated funds or by private capital as authorized by special use permits. In the latter case, individuals or business organizations develop sites for public use and pay an equitable fee into the U.S. Treasury for the privilege of using public sites. The increase in accommodations at these areas during the past fiscal year is shown below.

SPECIAL FACILITIES

	June 30, 1966	June 30, 1967	Net change
Organization camps	587	573	−14
Hotels, lodges, resorts	417	415	−2
Commercial public service sites	167	163	−4
Swimming sites	249	271	22
Boating sites	615	673	58
Observation viewpoints	371	397	26
Winter sports sites	197	202	5
Total	2,603	2,694	91
Capacity, persons at one time (PAOT):			
Organization camps	75,111	73,843	−1,268
Hotels, lodges, resorts	55,726	55,671	−55
Commercial public service sites	14,653	13,233	−1,420
Swimming sites	42,073	45,556	3,483
Boating sites	50,070	56,113	6,043
Observation viewpoints	21,501	22,633	1,132
Winter sports sites	303,375	307,225	3,850
Total	562,509	574,274	11,765

Overall Recreation Use

In 1965, the Forest Service began using a new unit of measurement for recording recreation use of the national forests and national grasslands. This is the "visitor-day," adopted by all Federal agencies for uniform reporting of recreation use to the Bureau of Outdoor Recreation. One visitor-day is equivalent to an aggregate of 12 person-hours of recreation activity.

In 1967, the Forest Service estimated 150 million visitor-days of use on national forest system lands. While this is 1 million visitor-days less than reported in 1966, the 1967 figures do not represent an actual reduction in use; rather, they reflect more intensive standards of measurement and a correction of past estimates. These standards have been applied by:

1. Expanding the statistical sampling of recreation use to a total of over 600 major recreation sites.
2. Intensively sampling recreation use at a winter sports complex.
3. Effectively demonstrating a system to measure the total recreation use of two entire ranger districts.
4. Comparing over a period of 2 years the actual recreation use measured at specific sites to determine a statistically reliable indicator of the trend in use. (For 1967 this was a 7-percent increase at major developed sites where use was actually measured.)

New knowledge gained from applying the above standards clearly shows that recreation use of the national forests continues to expand and that overuse of facilities remains a serious problem.

Recreation Information Management

Since 1965, the Forest Service has been developing a special management system to help cope with the need for information about the recreation resources of the national forests. This is the computer-oriented Recreation Information Management (RIM) program. The system provides for collection, analysis, storage, and retrieval of data on all recreation sites and areas in the national forest system, including their biological and physical characteristics and condition, their capacity, and the volume and kind of use they support.

By the end of calendar year 1967, this system was approximately 60 percent operational, and included:

1. Inventory—
   a. Site and area location, description, and condition.
   b. Facilities and improvements; number, type, location, and condition.
2. Measurement, analysis, and reporting of recreation use.

When fully operational, the system will also provide management data about:

1. Plans- and management-progress relationships.
2. User information to facilitate locating and enjoying available sites and areas.
3. Projection of recreation use.
4. Biological-physical relationships.

Wilderness

Continued progress has been made in implementing the Wilderness Act of 1964.

Review of one-third of the national forest primitive areas was completed by September 1967. This met the schedule set forth in the Wilderness Act. These reviews resulted in proposed recommendations calling for 12 additions to the National Wilderness Preservation System. The areas are:

Arizona:

Mount Baldy Wilderness, Apache National Forest.
Pine Mountain Wilderness, Prescott and Tonto National Forests.
Sycamore Canyon Wilderness, Coconino, Prescott, and Kaibab National Forests.

California:
San Rafael Wilderness, Los Padres National Forest.
San Gabriel Wilderness, Angeles National Forest.
Desolation Wilderness, Eldorado National Forest.
Ventana Wilderness, Los Padres National Forest.
Colorado:
Flat Tops Wilderness, White River and Routt National Forests.
Montana:
Spanish Peaks Wilderness, Gallatin National Forest.
Oregon:
Mount Jefferson Wilderness, Deschutes, Mount Hood, and Willamette National Forests.
Utah:
High Uintas Wilderness, Ashley and Wasatch National Forests.
Wyoming:
Washakie Wilderness, Shoshone National Forest.

Work is well underway in the review of a number of other primitive areas. The Geological Survey and the Bureau of Mines in the Department of the Interior have an important role in completing mineral examinations on the areas being studied. Their studies have been most helpful.

Visitor Information Service

Visitor Information Service is an information, interpretation, and education program that extends a more meaningful and varied experience to the national forest visitor. It provides information about the national forests to writers, editors, and the media searching for outdoor information. Potential visitors to the national forests thus obtain better background information to aid in planning their vacations.

The program provides readily available information about the highlights and facilities on the forest to help make the visitor welcome and more comfortable in the forest environment. Interpretation and education bring in-depth meaning to the variety of things to do on the national forests. In these programs, we stress participation in order to stimulate the visitor's curiosity and satisfy his desire for understanding of natural resources and their relationship to man's environment, as well as to provide an enjoyable experience.

The facilities to carry out the program in the forests include interpretive trails, vista points, overlooks, study areas, visitor centers, information stations, wayside exhibits, and interpretive signs. Activities such as campfire programs, guided walks, and self-guided auto tours add greatly to visitor participation.

During 1967 four new visitor centers were opened to the public. At Cranberry Mountain, on the Monongahela National Forest in West Virginia, the visitor center concentrates on a natural resource story. The Chattahoochee National Forest's Brasstown Bald Visitor Center at the highest point in Georgia, 4,784 feet, offers a striking view while exhibits show the use of the land and its resources from the time of the Cherokee Indians to the present. The theme of the new Cape Perpetua Visitor Center on the Siuslaw National Forest of Oregon is the forces-of-nature story occurring where the forest meets the sea on the Oregon coast. In contrast, the Earthquake Visitor Center in Montana on the Gallatin National Forest relates the geology story of the 1959 earthquake.

Over 50 new interpretive trails were constructed. A special "Braille Trail" for the blind was dedicated during the summer on the White River National Forest in Colorado. In the national forest system 110 vista points and wayside facilities were developed at scenic spots. Other developments during the year include interpretive signs, self-guiding auto tours, and written guides for self-guiding facilities.

The development of facilities and activities are an outgrowth of study and planning in which we consider the needs and demands for information and interpretation by visitors. People affect the extent and intensity of the program at any given site. Local visitors, campers, picnickers, skiers, hunters, fishermen, schoolchildren, sightseers, hikers, horseback riders, water-sport fans, rock hounds, and history buffs are examples of the variety of persons served by the program.

Special Uses

National forests and national grasslands serve many other uses besides those related to renewable natural resources. These other uses range from airport beacons to apiaries, from wayside stands to winter resorts—80 different kinds of uses. Such developments are authorized by special-use permits issued to individuals, business establishments, civic groups, and government agencies that operate the facilities. These developments represent a total private investment on national forest land of almost a billion dollars. The number of permits and the fees paid for them have been increasing steadily in recent years. The number of permits issued by or administered by the Forest Service continues to increase steadily—from 64,000 in 1966 to 65,000 in 1967. Receipts to the U.S. Treasury in fees from these permits totaled $2,690,620 during fiscal year 1967; an increase of $134,378 over fiscal year 1966.

New Fee System Introduced

In July, the Forest Service's Graduated Rate Fee System was presented to about 1,800 special-use permittees for review and comments. This is the first of the servicewide review of methods of determining fees for commercial public-service permits since 1950. The new system provides a progressive series of rates to be applied to gross sales. These rates reflect the relationship of sales to investment. The comments received generally agreed with the principles involved, but—in some instances—they took exception to the rates actually set. It is planned that, after analyzing the comments, a set of instructions will be developed and put into use by July 1, 1968.

Landscape Management

The skills and technical means required to protect and enhance national forest landscapes, while

developing the commodity-resource uses that they must also support, are reflected in planning multiple-use management of the national forests. Special regional "Natural Beauty" training sessions and seminars were held during the year, and a slide-tape program on "Forestry and Natural Beauty" was developed and put into use. The Forest Service continues to employ and utilize the unique skills and talents of a large force of landscape architects.

National Recreation Areas

Progress has been good in planning the development and management of the three new National Recreation Areas administered by the Forest Service: Spruce Knob-Seneca Rocks, Monongahela National Forest, W. Va.; Shasta and Claire Engle units of the Whiskeytown-Shasta-Trinity, Shasta Trinity National Forest, Calif.; and Mount Rogers, Jefferson National Forest, Va.

At the end of 1967, these three National Recreation Areas had a capacity to accommodate approximately 16,000 persons at one time at developed recreation sites (campgrounds, picnic grounds, swimming and boating sites, motels, lodges, and similar facilities). As development of these areas proceeds, this capacity will be expanded several-fold. The areas can also accommodate tens of thousands more in such dispersed-type pursuits as hunting, fishing, driving, hiking, riding, birdwatching, and enjoying the scenery. Recreation use of these three National Recreation Areas in 1967 totaled 2,989,000 visitor-days. Use of camp and picnic grounds was 543,600 visitor-days.

WILDLIFE MANAGEMENT

The national forests and national grasslands, with their wide range of elevations, topography, and vegetation, provide the sportsman, birdwatcher, and naturalist with a broad choice of experiences. The expectation of seeing wildlife in a natural setting motivates many people to visit these public lands. These extensive areas are open to public hunting and fishing under State fish and game laws and regulations. They usually provide hunters, fishermen, and sightseers with better than average success in their favorite pastimes.

Management of Fishing Waters

The current inventory of fishing waters and the use that fishermen make of these waters demonstrate the tremendous value of the sport fishery resources within the national forests. More than 84,000 miles of streams produce resident game fish, some 18,000 of which also support anadromous fish—principally salmon and steelhead. These national forest waters constitute more than one-fifth of the cold-water streams in the United States, excluding Alaska.

More than 1¼ million acres of natural lakes, generally situated at the higher elevations, provide a combination of cold-water fishing and superb scenery. These national forest lakes amount to more than one-half of the cold-water lakes in the United States, not including the Great Lakes. Nearly a million acres of manmade reservoirs, supporting cold- and warm-water fishes, add to the fishery values.

There is a large backlog of work needed to restore the productive capacity of many streams. Each region of the Forest Service has one or more fisheries specialists who provide regional guidance in fish habitat protection and restoration. This is particularly important because many quality fishing streams are highly vulnerable to damage from other resource activities and uses.

Management of Game Ranges

To help insure effective management of wildlife habitat in the field, habitat management plans are prepared for each administrative unit and for major wildlife species. More than 1,200 plans are now in use. In the management of wildlife range (principally big-game ranges), nearly 29,000 permanent transects have been installed in recent years for measuring range condition trend, forage utilization, and wildlife use. In addition, about 1,200 wildlife exclosures have been constructed to determine the effects of wildlife use on vegetation and soils. The information provided by these transects and exclosures is used in support of sound game management programs of the respective States.

To provide the technical guidance required in habitat management on national forests, more than 100 wildlife biologists are serving—at least one in each regional headquarters and the others on forest supervisor staffs. Their primary function is to insure that wildlife habitat is properly managed or enhanced and that the needs of wildlife are fully considered in, and coordinated with, other resource activities.

Wildlife Habitat Improvement

More attention is being directed to the habitat needs of species of wildlife that have particular local and national public appeal. This includes nongame species and rare and endangered species. National forests have long been recognized for their superb big-game hunting opportunities and for sport fishing. As these uses increase, productive capacity of the land and waters must be increased to help meet these pressures.

Habitat improvement is generally achieved through special protective or cultural practices or construction projects. Most work is done cooperatively with the State fish and game agencies under some form of cost-sharing agreement. Improvement of wildlife food and cover can also be achieved through effective coordination and planning with other resource activities. About 30 percent of the accomplishments during the past year resulted from these planned coordination programs.

The following habitat improvement work was completed on national forest system lands in fiscal year 1967. About 46 percent of the total costs was paid by the States under cooperative programs.

Wildlife food and cover improvements:	
Seeding and planting forage	46,449 acres
Release of forage plants	19,507 acres
Prescribed burning	54,081 acres
Protecting key wildlife areas	19,464 acres
Permanent openings	10,256 acres
Small water developments for wildlife:	
Ponds, troughs, guzzlers, etc.	1,138 items
Waterfowl wetland improvements	768 acres
Fish stream improvements:	
Channel structures	1,036 items
Spawnbed improvement	758 rods
Stream barrier removal	507 items
Protecting stream channels	4 miles
Rough fish removal	67 miles
Fish lake improvements:	
New fishing lakes	1,436 acres
Fish shelters and spawnbeds	886 items
Aquatic plant control	3,931 acres
Rough fish removal (primarily under State programs)	47,488 acres

FIRE CONTROL

The year 1967 was a difficult one. In Washington, Oregon, Montana, and Idaho the warmest and driest summer on record confronted fire control forces with their toughest task since 1910. Between August 11 and September 12, over 3,500 fires occurred on the western forests. Teamwork, fast initial attack, plus energetic reinforcements stopped nearly all these fires before they inflicted serious damage. Only 46 reached more than 100 acres in size. The two largest and most damaging—Sundance and Trapper Peak—escaped protection association forces and swept onto the Kaniksu National Forest from outside the forest boundaries.

The dry summer in the Northwest was preceded by a wet spring. However, the rains ceased in June, temperatures rose to record levels, and it was late September before rains reduced burning conditions to near normal. Outside the national forests hundreds of additional fires started on lands protected by other Federal and State agencies. By August 31, the severe fire threat in Idaho caused President Johnson to declare major portions of that State as a disaster area.

From the standpoint of emergency fire suppression expenditures, 1967 was one of the most expensive in the history of the Forest Service. But considering the resources saved from burning, it was a year of substantial achievement. Despite sustained, critical conditions in the Northwest, loss from fire on all lands protected by the Forest Service was held to 208,236 acres burned. Without modernized fire control capability, and strong interagency cooperation, 1967 might have been a replica of 1910. That year saw 2,800,000 acres burned in Montana and Idaho alone.

Strongest Force Ever Assembled

To control escaped fires in the Northwest, the Forest Service mobilized 15,000 firefighters and brought supervisory personnel from every part of the continental United States including Alaska. Firefighters included trained crews of Indians, Spanish Americans, agricultural workers, and loggers. Through cooperation with the Bureau of Land Management, Eskimo crews from Alaska were used. Versatile Forest Service smokejumpers attacked more fires than ever before. A total of 4,123 individual firejumps were made. Valuable help was also given by the National Guard, Army Reserve, the U.S. Army, and the Air Force. In support of these men were hundreds of aircraft, and bulldozers, a variety of automotive equipment, and tons of miscellaneous equipment and supplies. It was a gigantic operation.

Managing this most powerful striking force in Forest Service history was a staggering logistical challenge. Coordinating strategy, tactics, manpower and supplies between going fires centered in Forest Service regional offices at Missoula, Mont., and Portland, Oreg. Interregional coordination was accomplished through the Service's National Fire Coordination Center at Rosslyn (Arlington), Va.

Effective Firefighting

Well-trained firefighters are still the backbone of effective fire control. Recently, however, many innovations have contributed to their effectiveness, and this year the payoff was big. Better control plans were made because airborne infrared mapping produced accurate intelligence through smoke and darkness. Thousands of men were fed quickly and economically near the fireline because prepackaged, portable kitchens and precooked frozen meals were available on a large scale for the first time. Pinpointed drops of fire-retardant chemicals from helicopters kept many spot fires in check. Large helicopters got men and supplies quickly to critical locations near the fire's edge. Water for control and mopup was delivered in improved plastic slip-on tanker units. And air tankers again delivered fire retardants in large volumes to help hold fires in check.

All this support made firefighters more effective in 1967. What's more, due to progress in fire-control training, both the firemen on the line and the supervisory personnel were better qualified. Training simulators continued to bring realism to the classroom, and a new simulator is now under development to strengthen training for initial attack. A fire-control training support center was established at Marana Air Park, Ariz., to develop training aids and course material for national training. During 1967, a National Fire Behavior Training School was held there. Programed instruction and progressive referral texts continued to contribute to the fire-control training program.

Firefighting Safer

Fighting forest fires is dangerous work. But in 1967 it was safer than ever before. Many firefighting sectors were safer because modern two-channel radios provided more positive communication between key personnel and supporting helicopters. Improved lightweight shelters were available to firemen for protection in case they were trapped by fire, and a training film was prepared showing how to use the shelters. To reduce a mounting trend of helicopter accidents, a special nationwide air safety program was launched.

As a result of new and past safety measures, about 50,000 firefighters worked, incurring only a few disabling injuries. This is a good record. But among the accidents were 4 fatalities. Fire leaders are resolved to do even better.

Cooperation Strengthened Control

From ranger district to international relations, cooperative endeavors strengthened fire control.

Because of joint Forest Service-military-State and other Federal efforts, all protection agencies were better able to cope with the huge fires in the Northwest. Several large fires studied in cooperation with the Office of Civil Defense contributed data to improve plans for defending the United States from fire in case of enemy attack. Fire defense plans for several States were improved. Cooperative work with the National Fire Protection Association and railroad companies laid the groundwork for further reduction in fires caused by railroad operations.

The Forest Service exchanged mutually beneficial cooperation with several neighboring countries. In Idaho and Minnesota, Forest Service firemen fought border fires jointly with Canadian firemen. Technical developments were exchanged with Australia, and we extended professional assistance to improve fire control in the Dominican Republic, Chile, Brazil, Venezuela, the Philippines, and South Africa.

Hazard Abatement

Fire hazards were reduced on 320,000 acres by disposing of debris created by timber harvest, right-of-way clearing, and similar operations. To minimize fires caused by the occupants of passing automobiles, flammable vegetation was removed from 1,000 miles of roadside. Fire-breeding snags were felled on more than half a million acres.

Slow but significant conversion of fuels to less flammable conditions continued to reduce the threat from fire. Some 50,000 acres of naturally hazardous fuels were made less dangerous and 1,000 miles of firebreaks and fuelbreaks were constructed. This work has strong potential to permanently reduce the threat from large, damaging fires. Much more of it needs to be done.

Fire and Forest Management

Uncontrolled fire in the forest is a destructive demon. Conversely, controlled fire is in some instances a valuable forest management tool. In addition to coping with numerous wildfires, in 1967 Forest Service fire control personnel applied fire scientifically to 600,000 acres. On the Flathead National Forest, research scientists and fire control officers joined together in a study to develop better ways to use fire to enhance multiple-use management of forest land.

ENGINEERING

Roads and Trails

The roadside appearance of our highways and roads is a challenge to design and management, and considerable improvement is being made. The safety factor has always been considered an important part of planning our roads and trails. The Highway Safety Act of 1966 will bring about improvements on standardization and will result in close cooperation with the States on identification and surveillance of accident locations, and in reevaluation of road design, construction, maintenance, and traffic control devices.

Our highway and forest roads and trails must be safe, attractive, functional, and economical. In addition to these basic goals, they must provide a pleasant experience to the forest user by creative planning and careful engineering.

The Division of Engineering is currently studying ways to make forest roads safer and more enjoyable to the motorist. These include break-away type signs, stable roadsides, and the removal of obstructions such as some types of cattleguards, guide posts, culvert headwalls, and bridge designs.

We are designing posters with a modern look, which combine art symbols, color, and wording in concise, understandable language and in sizes suitable for any given road-speed situation.

Our aim is to develop a total road concept that obtains the ultimate in alinement, economy, safety, esthetics, and land-use values; not only for the present, but with long-range objectives for the future.

In 1967, in cooperation with the Forest Economics and Marketing Research Division, we completed the study of "Advance Construction of Timber Access Roads on the National Forests." This study was in response to Recommendations 48 and 49 of the Joint Management Improvement and Manpower Review Team.

In September 1967, we began the "Origin-Destination Study" of traffic on the Tellico River Road, Cherokee National Forest, Tenn. This study is a portion of the overall traffic study on the Tellico River Road which is designed to determine speed, parking, safety, design, and other requirements for traffic on a typical heavy recreation-use Forest Service road.

We have made considerable improvements in the application of modern engineering technology in fiscal year 1967. We have completed programing and a servicewide training session to automate the preparation of our annual roads and trails pro-

gram of work. This program includes automating the planning and programing of work on each forest development transportation system project.

The tentative program can be processed for 2 to 5 years ahead. Priorities are assigned on a regional basis. The annual program of work can then be increased or decreased readily. In the past, weeks and months were required to make such changes and to analyze the effects.

The road design system for five regions using the CDC 3100 computer has been completed. The system has improved our design process by making it easier for engineers to make changes. It has also speeded up the process by using the improved capabilities of the CDC disk storage and floating point hardware.

Funds obligated for maintenance, flood repair, and construction from forest roads and trails authorizations amounted to $118,313,000, and $1,394,000 from miscellaneous sources.

During fiscal year 1967, 1,482 miles of roads, 677 miles of trails, and 181 bridges were constructed or reconstructed from regular forest roads and trails funds.

In addition, purchasers of Government timber under the terms of timber sale contracts constructed or improved 4,271 miles of road and provided maintenance on 20,560 miles of road.

At the end of fiscal year 1967, the lands administered by the Forest Service were served by a transportation system which included 193,000 miles of forest development roads, 102,026 miles of trails, and 439 landing fields for fixed-wing aircraft.

We are studying the desirability of road-base and surfacing criteria for Forest Service roads. A preliminary appraisal indicates that adopting servicewide base and surfacing criteria would reduce the road construction costs and provide alternative ways to tailor the base and surfacing courses to the traffic requirements of a particular road. The criteria being studied would depend upon subgrade bearing strength as the principal base and surfacing design parameter. At this stage, we do not know what road and base criteria would do to the user economy, but we have identified this as an important consideration.

We have also taken a new look at the treated timber bridge, and we believe we have identified some fastening deficiencies of this structure which limit its effectiveness. The Forest Products Laboratory is investigating these fastening deficiencies and is studying improvements which could make treated timber more competitive with other bridge construction materials.

Buildings

During the past year construction continued on eight major buildings which will provide much needed space and facilities for visitor information services and forest research activities.

We began design on 19 major buildings which will provide space for a forest headquarters, visitor information services, and research.

We have started numerous small administrative site improvements costing less than $50,000 each and completed many in the past year. These include small barracks, offices, messhalls, garage shops, and residences.

Equipment and Systems

Current level of work at Equipment Development Centers has increased about 8 percent over calendar year 1966. A total of 110 equipment development and test projects are underway. Much of the work during 1967 involved design, test, and improvement of equipment already under development or in use. We have greatly improved equipment and components which will result in greater and more reliable production and hence reduce costs.

We have successfully recruited specialists to improve our equipment development capabilities in aviation, recreation, sanitation, and solid waste disposal.

After 6 years of our cooperative work with the Society of Automotive Engineers, national standards for test of spark arresters are completed. The standards will be published by SAE. We have completed nearly 400 spark arrester tests under the qualifications test program, including 320 commercial models. A new edition of the "Spark Arrester Guide" was published. It lists 158 qualified arresters.

Under contract with industry we have made much progress in the development of a successful machine for cleaning silt and other fine material from gravel in salmon spawning areas. Our testing during 1966 indicated nearly 30 major deficiencies involving both vehicle and dredge equipment. Extensive modifications and tests in 1967 eliminated the vehicular problems. Remedial modifications are planned, and work to correct the three remaining deficiencies in the flushing system is underway.

We have moved ahead on three Timber Management Development projects:

1. A pine seed drill featuring a device capable of consistently dispensing one seed at a time has been developed and a report published.
2. A report on the forest land tree planter machine, which incorporates a newly developed automatic seedling-setting device eliminating danger to operator in hand-setting of seedling, was published.
3. A gopher burrow and baiting machine was successfully developed for control of rodents in forest plantations.

We have published reports on prevention of injuries from chain-saw kickback, emergency blankets, and safety footwear, and we gathered and distributed information on eye-protection devices.

Equipment Management

The Department of Agriculture, General Services Administration, and the Forest Service are continuing a joint study of ways in which Interagency motor pools and agency fleets can be most effectively coordinated to produce an overall savings to the Government.

In fiscal year 1967 we tested the Fixed Ownership Rate (FOR) in three of our regions. This test successfully improved utilization and management criteria with a reduction in cost. We have expanded the test to three more regions for fiscal year 1968. The other three regions will be included in fiscal year 1969. The FOR system appears to be a major step ahead in management.

During fiscal year 1967, the Forest Service owned, operated, and maintained a fleet of 13,059 sedans, stationwagons, buses, and light trucks, 191 wheel tractors, 564 crawler tractors, 381 motor graders, 168 loaders, and 578 pieces of other construction equipment. Forest Service vehicles traveled more than 111 million miles last year while the Agency carried on its complex responsibilities of managing the national forest lands. (The above figures included our Job Corps program.)

Job Corps Conservation Centers

In the past year we developed detailed designs and training manuals for residences to be constructed by Job Corpsmen as work projects, and also developed design criteria for construction of future conservation centers. We formulated instructions for building fire prevention and training programs in conservation centers, and provided leadership to field officers' effort to support the Job Corps operation and work projects.

Water and Sanitation

We have begun development of a satellite program to the Recreation Information Management (RIM) system for evaluation of pollution potential of administrative sites. It is anticipated that a program will be developed that can directly print out our program and progress each year. We still need agreement on suitable criteria for establishment of the program.

During the past year we completed a preliminary survey of air pollution sources. This needs refinement and expansion to include all Forest Service installations. It is anticipated that this can also be adapted as a RIM satellite.

Property Corners and Lines

The Forest Service has over 281,000 miles of property lies and more than 1,132,000 property corners that control these lines. Many of the surveys which established these property lines and corners were done over 100 years ago. Much of the survey evidence has now disappeared.

Effective management of national forest system lands requires that property lines of these lands be accurately located and plainly marked on the ground. To accomplish this the Forest Service, beginning in 1958, has conducted a special cadastral engineering program designed to preserve existing surveyed property lines and corners, reestablish lost survey lines and corners, and establish new survey lines and corners needed to locate on the ground the correct property lines between national forest land and adjoining land.

Under this program in fiscal year 1967, Forest Service cadastral surveyors (with the Bureau of Land Management, local registered land surveyors, and interested adjoining landowners cooperating in various phases of the work) conducted intensive ground search for 27,000 national forest system property corners; recovered authentic evidence of 19,500 of the corners; searched and determined that 7,500 of these corners have been destroyed and lost; placed new enduring official monuments at 15,000 verified recovered corners; and conducted over 900 miles of official cadastral surveys to reestablish 1,375 lost corners. In addition to this, 1,400 miles of property lines were cleared, marked, and posted to Forest Service recommended standards, and 800 miles were marked to interim standards to facilitate management of national forest system lands and of adjoining lands owned by others.

Surveys and Maps

Maps are a basic need for professional forest management. Complete map coverage of our national forests and grasslands is still lacking but map production is steadily increasing. The area of national forest interest is now 640,354 square miles. In fiscal year 1967 the Forest Service produced 16,198 square miles of planimetric maps and 2,010 square miles of topographic maps, to bring total coverage to 71 and 46 percent, respectively. Over 1,000 specialized maps were prepared by field offices for timber sales, site plans, and other localized needs. Over 125 road projects were studied or designed by modern photogrammetric techniques.

Aerial photography is being relied on more heavily for both general resource management needs and for special purposes such as forest fire rehabilitation planning, and insect and disease infestation evaluation.

In fiscal year 1967, 43,852 square miles of forest were photographed at a cost of $171,562. There were five other special projects covering 1,168 square miles which were photographed at a cost of $7,158.

LANDS

The Forest Service and National Park Service concluded joint studies relating to proposals that legislation be enacted for the designation and administration of Flaming Gorge Reservoir and adjacent lands as a national recreation area. Some 78,000 acres within the Ashley National Forest in Utah are administered by the Forest Service, while about 123,000 additional acres have been administered by the Park Service. Findings are that a national recreation area would be in the public

interest, and that administration of the recreation and other renewable resources on all of the area by the Forest Service would promote economical management and uniformity of procedures and regulations.

Additional planning data, especially on recreational development needs and land-use requirements, have been obtained for a 350,000-acre unit in and near the Sawtooth Mountains of southern Idaho.

Transfer of land jurisdiction among Federal agencies has been continued for purposes of improved economy in public land management and better public service. Some 7,400 acres suitable for public recreation and other multiple-use purposes at four reclamation reservoir projects were transferred to administration of the Forest Service for management with adjacent national forest lands.

Since enactment of Public Law 89–72 in 1965, such transfers exceed 20,000 acres involving projects in several States. Others are in process. In addition, more than 20,000 acres of public domain within national forest boundaries were made subject to administration under regulations and appropriations applicable to national forest lands. This formerly private land was acquired by the BLM in exchange for numerous tracts of scattered public domain that were too isolated for practicable administration by that agency. Addition of the acquired land to the national forest system has operated to reduce intermixed patterns of landownership and attendant problems. In other actions, national forest boundaries were retracted to exclude blocks of private ownership totaling nearly 39,000 acres.

Land Acquisition

A total of 615 land purchase cases involving 129,107 acres were approved during 1967. Of these properties, 394 cases involving 89,471 acres are being acquired through the use of Land and Water Conservation Fund (L&WCF) moneys (Public Law 88–578, approved Sept. 3, 1965).

These lands have outstanding values for intensive recreation development, hunting, fishing, hiking, swimming, boating, wilderness enjoyment, and other recreation pursuits. Some 215 cases, totaling 29,331 acres, involved routine Weeks Law purchases of lands needed for consolidation of the Government's ownership for more effective resource management. Purchase transactions totaling 163,144 acres, most of which were approved in previous years, were completed during the year.

Particularly significant is progress in the newly established Redbird Purchase Unit in eastern Kentucky. This unit was established on the mountainous headwaters of the south fork of the Kentucky River as a part of the Appalachia program. The area has produced many major floods, causing millions of dollars of damage downstream. Purchases already completed total 59,158 acres—enough to establish a fully functional ranger district. An additional 10,842 acres are under contract for acquisition.

Donations

Eleven donations of land totaling 306 acres were approved during 1967 and eight cases, 91 acres, were completed. These donations came from public-spirited individuals, States, counties, and school districts desiring to place this land under Forest Service multiple-use management.

Land Exchanges

During the year, 155 land exchanges were approved. In these transactions the United States will receive 83,813 acres and will grant in exchange 81,550 acres. Completion of these cases will result in material cost avoidance in the operation of the national forest system.

Scenic Easements

The first scenic easement within the national forest system has been approved. This first acquisition is to preserve and protect the source of the Metolius River, Deschutes National Forest, Oreg. Other scenic easements have been designed and are in the process of acquisition in Spruce Knob-Seneca Rocks National Recreational Area, W. Va., and for the south fork of the Shenandoah River, Va. These are the forerunners of a new program to protect natural beauty, further enhancing recreation enjoyment of the national forests.

Completion of various land adjusiment transactions during the year resulted in the following changes in national forest system property:

	Acres
Total area administered by Forest Service (owned by the United States) as of June 30, 1966	186,497,010
Increases:	
Purchased	163,144
Conveyed to United States in exchange	91,793
Donated to United States	91
Transferred from other Federal agencies	27,410
Recomputations and adjustments due to status study, net increase	95,370
Total increases	377,808
Reductions:	
Conveyed by United States in exchange	74,045
Grants, sales, reconveyances, mining patents, etc	1,752
Total reduction	75,797
Net change, an increase of	302,011
Total area administered by Forest Service (owned by United States) as of June 30, 1967	186,799,021

Road Rights-of-Way

During fiscal year 1967, a total of 1,319 rights-of way were obtained involving 920 miles of proposed and existing roads.

Cooperative agreements are entered into with private landowners for joint construction and use of roads which serve intermingled private and

national forest lands. In fiscal year 1967, 21 such agreements were completed and 49 supplements to these and previous agreements, providing for cooperative construction and use, were negotiated. Involved were 332 miles of roads costing $6,401,-855 and providing access to 9.7 billion board feet of national forest timber and 2.7 billion board feet of private timber; in addition, providing multiple-use management opportunities to many thousands of acres of both public and private lands.

Agreement was reached with the Bureau of Public Roads on the form of easement and the stipulations to be used in connection with interstate and Federal aid highway rights-of-way across lands administered by the Forest Service. The review and approval of 73 cases was completed during the year.

An agreement was completed providing for the Bureau of Land Management to withdraw rights-of-way and transfer jurisdiction to permit issuance of USDA easements to cooperators for segments of roads crossing lands administered by BLM.

Land Status Records

Accurate, readily available records of land ownership and status go hand-in-hand with adequately marked property lines as essential tools in installing and operating forest and wild land management programs and practices. A new status records system to more fully meet this need has been devised and is being installed. At the end of fiscal year 1967, the records had been completed for 7,600 of the 17,000 townships in which national forest lands are located. If the work is continued at the present rate, the conversion job should be completed in the next 5 years and the records placed on a current maintenance basis.

Administrative Support Functions

The success of all Forest Service programs, whether national forest management, forestry research, or State and private forestry, depends to a great extent on the support of administrative operations. Personnel management, through recruitment, proper grading, training, and counseling, insures that the high caliber of Forest Service employees will be maintained. Budget and fiscal operations oversee the use of funds to the maximum benefit of the Service and the public. Administrative management concentrates on handling business operations efficiently and economically. New and special programs receive the intensive planning necessary for their successful completion. Publications, procurement, communications, legislative liaison—all these functions play important support roles in the work of the Forest Service.

DEFENSE PREPAREDNESS

The Forest Service is one of the Federal agencies participating in the national defense readiness effort. Defense activities are part of Forest Service programs. We also cooperate with other departmental agencies, several units of the Department of Defense, and the Office of Emergency Planning on the Nation's defense.

Fire Defense

Field application of airborne infrared mapping of forest fires (see under Research, p. 5) was jointly evaluated for potential defense operation with the Office of Civil Defense.

Fire research personnel advised defense agencies on wartime fire defense and thermal effects of nuclear and conventional weapons. Fire specialists participated in programs of the Advanced Research Projects Agency, the Office of Civil Defense, the Defense Atomic Support Agency, the Bureau of Naval Weapons, and the Army Research Office; and presented technical papers to the Tripartite Technical Cooperation Programme at Washington, and the combined air staffs of the United States and Canada.

Project Flambeau, a study of the environment of mass fires, became a formally sponsored project of the (Quadripartite) Technical Cooperation Programme. Although policy is directed by TCP Working Panel N–3 (Nuclear Thermal), the Forest Service retains technical direction of the project. A Forest Service scientist serves on the panel with British, Canadian, and Australian counterparts.

Other fire defense activities involved: (1) Work on surface and upper air instrumentation on both the meso- and micro-scale networks being installed at Fort Stewart, Ga., for the Naval Air System Command; (2) overseas field studies for the ARPA project on environmental modification techniques which will save the Air Force $15 million a year; (3) a joint study with the Office of Emergency Planning of forest and grass fires covering the entire spectrum of fire-control operations; (4) preparation and testing of data, methods, and procedures covering attack analysis and damage assessment for possible use by the Forest Service and the USDA State Defense Boards; (5) negotiation of a cooperative agreement with the Office of Civil Defense for development of sample fire plans; and (6) preparation and improvement of State and regional rural fire defense plans.

Defense related wood and wood products research stressed basic studies of pyrolysis and combustion reactions of wood as well as applied research on the effects of chemical additives, char-penetration characteristics, fire endurance of wood assemblies, and investigation of fire-retardant treatments.

The demand by military agencies for wood pallets surpassed supply. To increase pallet production, research is devising a wood fastener system which can be applied either automatically or semi-automatically.

Fallout Protection

New Forest Service structures have fallout protection integrated into their basic building designs. Thus, "hardened" dual-purpose space is achieved at little or no cost. Technical assistance is provided by the Office of Civil Defense.

Defense Readiness

We conducted 55 workshops in radiological monitoring to maintain the capability of 800 monitoring stations and 3,400 monitors. More than 7,000 employees received training in personal and family survival, shelter analysis and management, and other defense measures. Other USDA agency personnel shared this training when location and schedules permitted.

In June 1967 we reviewed our standby emergency procedures and improved relocation plans, emergency personnel cadres, and the "Chief's Disaster Plan for National Emergency." The disaster plan contains specific provisions for delegation of authorities, continuity of organization, and a

statement of emergency functions, organization, and staffing.

ADMINISTRATIVE MANAGEMENT

Civil Rights

Our efforts in this area relate to Executive Order 11246 and title VI of the Civil Rights Act of 1964.

The Service awarded about 2,500 construction, maintenance, and purchase contracts subject to Executive Order 11246. Prework conferences with contractors stressed the rules under this order as they applied to the prime contractors and any subcontractors.

Financial assistance under four Forest Service programs is subject to the requirements of title VI of the 1964 Civil Rights Act. Recipients' operations are periodically reviewed to assure continued compliance with the law. Out of 8,500 recipients, noncompliance action was necessary in only 0.5 percent of the cases (one case in every 200).

Cost Reduction

We continued to participate in the Government-wide Cost Reduction and Operations Improvement program. Our fiscal year 1967 $16.9 million CR&OI goal was exceeded by $3.7 million. Included in this reduction were savings from technological improvements in fire control and in other management areas. In the third annual awards ceremony held in March three Forest Service employees received the Secretary's Special Merit Award for outstanding cost reduction achievement.

Employee Suggestion Program

First place in the Department's Special Suggestion Campaign went to two Forest Service engineers this year. Besides winning for them a joint cash award of $5,180, the suggestion produced first-year benefits to the Service of more than $3 million. The award resulted from development of a computer program to provide control of balanced earthwork design in road construction projects, and is considered the most valuable suggestion ever received in the Forest Service employee suggestion program. Two other employees were honored as "Economy Champions" for their savings suggestions.

Organization

During the year intensive organizational studies were made of eight Washington office divisions: Cooperative Fire Control, Timber Management, Fire Control, Land Adjustments, Information and Education, Personnel Management, Range Management, and Job Corps Administration. As a result, several divisions made organizational structure changes that will help them handle increasing workloads and new programs.

The following field organization changes were made: (1) The headquarters of the Central Plains Forestry Office was moved from Lincoln, Nebr., to Chadron, Nebr.; the administration of the Buffalo Gap and St. Pierre National Grasslands with headquarters at Wall, S. Dak., was transferred from the Black Hills Supervisor to the Chadron office; and (2) through consolidation, the number of ranger districts was reduced by three.

New master organization plans were prepared for all units.

Communications and Electronics

During the first 9 months of 1967, 1,462 ADP registrations of the Department of Agriculture's radio installations were made with the Interdepartmental Radio Advisory Committee. Full registration will cover approximately 8,000 radiofrequency uses by the Department.

This summer's siege of fires in the West again demonstrated firefighters' need for reliable, rapid communications. More than 1,500 radio units were used on the Idaho-Montana-Oregon fires. Serious circuit loading required an emergency assignment of additional channels.

Other Accomplishments

Management Notes.—This internal publication for management improvement is now published quarterly and is sent to forest managers on the staffs of all cooperating State foresters.

Regional Office Workload Base.—The Forest Service maintains a base for staffing and financing its nine regional offices. During 1967, the work of the regional offices was redescribed and workloads were remeasured. Staffing guides will be developed during 1968 from the data.

Project Work Inventory.—Last year's automated inventory of all nonrecurrent work needed on national forest lands was updated. Repeated review of program proposals is developing a better basis for longrange planning and program integration.

Timber Sale Cost Study.—A district-by-district tabulation of jobs necessary for the marketing of national forest timber has resulted in standard time allowances for each job. Through use of the standard time allowances and predicted volumes of timber to be prepared for market, each unit can be allotted equitable marketing funds.

ADMINISTRATIVE SERVICES

To accomplish program goals, more than 5,800 contracts were awarded in 1967 with a value of almost $90 million. Although the total value of contracts decreased 12 percent from 1967, the number increased more than 4 percent. The numerical increase was accounted for by contracts being smaller and more diversified.

Programed instruction courses in real property management, small-purchases procedures, office procedures, and construction contract administration were contracted for and developed in 1967. Programed instruction provides education both for groups and individuals, and is becom-

ing increasingly important to improved job performance.

Procurement directives of the Forest Service were completely revised and updated, and redesignated as FS Procurement Regulations (FSPR's). The new format will complement the Federal and Agriculture Procurement Regulations.

Considerable savings were made by using excess personal property. Equipment, materials, and supplies acquired from other Government agencies were valued at $16,953,761. Of this amount, $8,726,241 was made available to the States through the Cooperative Forest Fire Control program. Five administrative sites were acquired, at a considerable saving, through the excess real property program. During the year many offices were moved into new leased space for greater efficiency and public convenience.

An automated mailing list for directives eliminated a mailing contract for bulk distribution. Direct mailing down to the forest level permits a delivery speedup of at least 15 days.

PERSONNEL MANAGEMENT

Training

A 1-year evaluation by Harvard University of an organization development pilot effort using managerial grid training was completed. The evaluation showed positive gains in organizational properties such as "interaction" and "climate."

In 1967 more than 40 employees enrolled for an academic year or more of study under the Government Employees Training Act at 15 State and three private universities, and in three foreign countries. They trained in wood and wood products research, program planning and budgeting, administration and management, fire behavior, water research engineering, transportation engineering, and forest literature. In addition, our inservice training program had some 25,000 participants in formal short courses. Programed instruction and other guided learning programs were produced and distributed in nine subject matter areas. Development work on 20 additional guided learning programs and tools is nearing completion.

"Mathetics"—an objective method for analyzing training needs and developing cost-effective guidance systems and instruction materials—was initiated this year. New training tools and programs based on mathetics will be ready for use early in 1968.

We anticipate outstanding results from the Lateiner system of safety attitude and behavior training which was put into service this year.

Recruitment and Standards

The Forest Service is an equal opportunity employer and continues to provide fair employment opportunity for minority group members. Nationwide needs were determined. Most of our recruiting activity centered at predominantly Negro colleges and schools located in the Southwest. Schools without programs geared to Forest Service careers were provided with suggested curriculum changes and additions.

Intensive recruiting resulted in placing minority group members in key staff positions in business management, programing, teaching, and counseling. We also actively participated in various manpower resource programs designed to aid disadvantaged youth. Among these are the Youth Opportunity Program, the Neighborhood Youth Corps, and the Job Corps.

At the end of fiscal year 1967, we had 43,424 employees, of which 2,305 or 5.3 percent were minority group members.

Women employees received special attention in 1967. A program of bringing women into the Washington office from field units for an "agreed-upon-tour-of-duty" was started. Also, we published the brochure "Women's Work in the Forest Service" to implement the Equal Employment Opportunity Program for women, and worked with the Department on developing a brochure for career opportunities for women.

Training sessions for technical personnel recruitment were held in Washington, D.C., and Madison, Wis., with field trips to four stations. These sessions resulted in the brochure "Challenge in Wood Research," and an examination announcement for research foresters and forest products technologists.

All placements GS–15 and above were made after consideration of all qualified Department candidates and the Civil Service Commission executive assignment system.

Qualification standards for corpsmen work supervisors at grades 5, 7, and 9 at Job Corps Conservation Centers were developed by the Forest Service and approved by the Civil Service Commission.

Through involvement in MOHR (Management of Human Resources), we completed development of a skills inventory and career appraisal system. In mid-January, the first inputs will be cranked into the system. It will be operational on a pilot basis in the Southern Region and the Forest Products Laboratory in May. If successful, it will become operational servicewide on July 1, 1969.

Employee Relations

Employee relations and remedial measures for undesirable behavior received a fresh look this year. As a result, postaudit of adverse action has become the responsibility of regions and stations. Discovering *why* and *how* the undesirable situation occurred is being emphasized.

Each employee now has the new requirements on employee responsibility and conduct, including conflict of interest. Fewer employees are required to submit conflict of interest reports while the Government's interests still receive protection.

Pay

We worked with the Civil Service Commission to tie Forest Service administrative boundaries with their 207 proposed wage areas for the new coordinated Federal Wage Program for blue collar workers.

Interim instructions to improve the applicability and administration of hazard pay have been developed and sent to our field units.

Personnel Officers' Meeting

A Personnel Management National Personnel Officers' meeting produced a study group to examine our temporary seasonal employment system. Some of the many results of the study group are: Combined employment summary and recruitment action lists, simplification of FSM instructions, and reduction of number of job categories. As a result of the Personnel Officers' Conference, the Chief also appointed a task force to examine all personnel management procedural systems in depth, and to recommend action to improve these systems. During the past year, this task force of field and Washington office employees has been gathering and analyzing problems connected with present personnel management systems as a basis for any needed future changes.

BUDGET AND FINANCE

Receipts and Expenditures

Receipts from the sale or use of national forest resources amounted to $182,663,890 in fiscal year 1967. These receipts came from the following major sources:

Timber	$172,788,648
Grazing	3,587,444
Other	6,287,798
Total	182,663,890

This total includes $6,837,609 received from national forest revested Oregon and California Railroad grant lands. In addition, resource revenue amounting to $1,852,969 was received from national grasslands and land utilization areas administered under title III of the Farm Tenant Act.

Other amounts received, not listed above, included $4,881,387 contributed by cooperators and timber purchasers for cooperative work on national forest programs, $23,411,756 set aside for timber sale area improvements, $9,874,679 set aside for brush disposal, $1,802,631 from miscellaneous receipts, and $9,543 for restoration of forest lands and improvements.

The Forest Service sold 188,955 Federal recreation area entrance permits for a total $1,322,685 not included in the receipt figures above. These receipts are available for appropriation by the Congress to the Land and Water Conservation Fund.

Direct receipts and deposits from all sources of national forest programs totaled $224,496,855. In addition, timber purchasers built roads valued at $50,715,357 incident to timber harvest. Other Federal agencies collected approximately $22,115,967 for power licenses, mineral leases, and permits on national forest land of public domain origin.

Operating expenses for national forest programs, national grasslands, and land utilization projects amounted to $240,630,910. Depreciation of roads, trails, and other improvements was estimated at $54,422,764.

Receipts and all other earnings exceeded operating expenditures and other charges by $2,274,505.

Expenditures for other Forest Service activities included $26,924,710 for cooperative State and private forestry programs, and $36,421,019 for forestry research. Cooperator contributions were $2,312,989 for cooperative forestry programs and $826,562 for research. The Forest Service also received $42,179 in royalties from the Smokey Bear forest fire prevention program.

Under the act of May 23, 1908, as amended, the Forest Service pays one-quarter of national forest net receipts to States for support of schools and roads in counties containing national forest lands. This payment in fiscal year 1967, based on fiscal year 1966 receipts, was $41,942,319. Arizona and New Mexico school funds also received $102,931 under provisions of the act of June 20, 1910. Under the act of June 22, 1948, Minnesota received $144,815. Counties containing national grasslands and land utilization areas received $451,432 for schools and roads from calendar year 1966 receipts under the act of July 22, 1937.

By law, the Service retains 10 percent of receipts from national forest resources for development of national forest roads and trails, except on revested Oregon and California Railroad grant lands. The amount retained in this fund in fiscal year 1967 was $16,778,480.

Financial Management Improvements

We completed a comprehensive study of financial management needs for improvement of financial reports to field managers. From this study will come a revised accounting system.

A detailed career development chart for accountants was prepared. Both employees and management will use it for career planning in this profession. A group of administrative and research personnel is working with personnel management in developing similar charts for all business management fields.

Business management aspects of forest firefighting during the extremely heavy 1967 fire season in the Northwest were given an on-the-ground analysis. As a result, there will be a revision of procedures, change of form designs, and extension of servicewide training plans.

JOB CORPS ADMINISTRATION

We completed another successful year of operating 47 Job Corps Conservation Centers on national forest land in 29 States. At the end of the year

there were over 8,000 enrollees in the centers. The Office of Economic Opportunity provides the Forest Service with funds to operate these centers under the Economic Opportunity Act of 1964, as amended. On July 1, under the terms of a revised OEO–USDA agreement, the Forest Service assumed responsibility for administering the education and enrollee activities in addition to previous responsibilities for center operations and the work program.

Education Program

The Economic Opportunity Act provides that each Job Corps enrollee participate in an education program. Basic education subjects include reading (about 40 percent of conservation center enrollees are nonreaders), mathematics, world of work, driver education, and physical education. Also available to each enrollee are extracurricular subjects such as handwriting, typing, health, and first aid. Job Corps enrollees, most of whom did not complete high school, may obtain a high school equivalency certificate. The General Education Development (GED) testing program, developed by the American Council on Education in cooperation with State departments of education, is used for granting this equivalency certificate.

Work Program

Another important part of an enrollee's Job Corps experience is work training. Conservation projects provide enrollees with an opportunity to construct needed public recreation facilities, trails, roads, and buildings, stabilize streambanks to control erosion, construct wildlife habitat improvements, and other conservation work. Enrollees receive a sense of personal pride from these achievements, many for the first time in their lives. For many, it may also be the first time they have received a word of praise for a job well done.

During 1967, the following conservation projects were completed:

2,000 acres planted and/or seeded.
2,100 acres of timber stand improvement work through release, thinning, and pruning.
800 acres site preparation for planting and/or seeding.
200 miles of range fence constructed.
300 miles of roads and trails constructed or reconstructed.
800 acres of fish and wildlife habitat improvement.
40 miles of stream fish habitat improvement.
80 utility systems installed—water, sanitation, and power.
500,000 square feet of buildings constructed—residences, offices, warehouse equipment storage, gas and oil house, and visitor information centers.
2,000 family recreation units—tables, stoves, sanitation facilities.

A unique, on-the-job training project is being conducted at Jacobs Creek Job Corps Conservation Center on the Cherokee National Forest in eastern Tennessee. Here the International Union of Operating Engineers has entered into an agreement with the Forest Service to train Job Corpsmen in heavy equipment operation. Corpsmen for this specialized training are selected from candidates submitted by all 88 Job Corps Conservation Centers operated by the Forest Service and by bureaus of the Department of the Interior.

Training consists of operation and maintenance of scrapers, 'dozers, high lifts, compressors, and roadgraders. Corpsmen carry out this field portion of their training by constructing and improving roads on the Cherokee National Forest. Classroom instruction includes such subjects as blueprint reading and basic mechanics.

Corpsmen who have completed this specialized training program have been placed in jobs. The average rate of pay before entering the Job Corps was $1.19 per hour, when they worked. The average rate of pay for this group is now $3.25 per hour. Placement is a joint effort by the International Union of Operating Engineers, the OEO and the Forest Service.

Other Antipoverty Efforts

During 1967, the Forest Service accelerated its participation in other Federal programs designed to assist in alleviating rural poverty. By linking regular Forest Service programs with antipoverty programs administered by the Office of Economic Opportunity, Department of Labor, and the Department of Health, Education, and Welfare, the Forest Service has provided a work-skills training program for needy rural residents. Several thousand disadvantaged youth and adults participated in Neighborhood Youth Corps, Operation Mainstream, Work Experience, and Work Study programs in which the Forest Service was the "host" agency.

PROGRAMS AND SPECIAL PROJECTS

The Planning-Programing-Budgeting System (PPBS) in the Forest Service is 2 years old. Concepts and methods continue to evolve. The work has been divided into three areas: Program Evaluation, Analytical Studies, and Special Projects.

Program Evaluation

Program evaluation for fiscal year 1969 was done by four committees, each chaired by a PPBS analyst. A special committee was established for the fire prevention and suppression program element. Thus, there was greater participation by all WO divisions and greater refinement of the program narratives.

The program evaluation committees attempted to estimate national need for program outputs, and determine what portion the Forest Service could

produce and at what price. This involved trying to answer such questions as:

—What output or mix of outputs a program should provide, and how the outputs should be measured?

—How much of each output should be provided in relation to actual and predicted demands?

—How and where should the outputs be produced?

—How should the output be scheduled over time?

The program evaluation was concerned with determining whether there were any shifts possible in current expenditures that would result in a greater total output value. Consideration was also given to investment opportunities for increasing outputs.

Formidable remaining problems in program evaluation present challenging opportunities for solution. We are continually striving to improve the factual basis for allocating funds among geographic areas and programs.

Analytical Studies

Analytical studies provide the basis for decisions on program issues and aid in making comparisons of alternatives with and among programs. The studies completed in 1967 are listed below:

1. The demand for domestic timber 1962–2020.
2. Opportunities for timber management intensification on national forests.
3. Survey of county dependency upon national forest timber sales in the Rocky Mountain area.
4. Computer model development for preparation and updating the program and financial plan for the PPB System.
5. Proposal to acquire Trinchere property in Costilla County, Colo., for national forest purposes.
6. Supporting information for Forest Service management plans in the Lincoln Back Country, Mont.

Personnel

The full professional PPBS staff has been recruited. Nine additional men are currently receiving full-time university training in systematic and economic analysis. Fifteen others attended 2-day PPBS orientation courses, and four took a 3-week course.

Organization

We are considering extending PPBS to field offices. Administrative management is undertaking a study to determine what organizational arrangement might work best.

Public Land Law Review Commission

The Commission held 15 hearings throughout the country and has 34 studies of public land laws, regulations, and management programs underway.

The life of the Commission was extended by law to December 31, 1970, and its funds were increased.

About four-man-years were required responding to requests of the Commission. This will more than double in 1968.

LEGISLATION

During the first session of the 90th Congress, the Forest Service followed on a day-to-day basis some 500 bills which would affect its activities. It prepared 104 legislative reports on bills and legislative proposals, assisted in the preparation and presentation of 26 statements before congressional committees; and reviewed and commented on 52 reports prepared by other Federal agencies. Legislative drafting services were provided as requested on 10 proposed bills.

Among the laws enacted in the first session of the 90th Congress which affect the Forest Service were: (1) An act to revise and extend the Appalachian Regional Development Act of 1965, and to amend the Public Works and Economic Development Act of 1965 (Public Law 90–103); (2) an act to extend the provisions of the Act of Oct. 23, 1962, relating to relief for occupants of certain unpatented mining claims (Public Law 90–111); (3) the Air Quality Act (Public Law 90–148); (4) an act to facilitate exchanges of land under Forest Service exchange authorities for use for public schools (Public Law 90–171); (5) an act to amend the McSweeney-McNary Act of May 27, 1928, relating to forest surveys (Public Law 90–193); and (6) the Economic Opportunity Amendments of 1967 (Public Law 90–222).

STATISTICAL TABLES

TABLE 1.—*National forest and other lands administered by the Forest Service, as of June 30, 1967*

State, Commonwealth, or possession	National forest [1]	National grassland	Land utilization projects	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	631, 623			631, 623
Alaska	20, 735, 040			20, 735, 040
Arizona	11, 436, 320			11, 436, 320
Arkansas	2, 434, 629			2, 434, 629
California	19, 969, 550		19, 115	19, 988, 665
Colorado	13, 735, 078	612, 189	560	14, 347, 827
Connecticut	10			10
Florida	1, 075, 702			1, 075, 702
Georgia	785, 065		9, 340	794, 405
Idaho	20, 293, 904	47, 599		20, 341, 503
Illinois	220, 183			220, 183
Indiana	135, 423		3, 180	138, 603
Iowa			360	360
Kansas		107, 255		107, 255
Kentucky	524, 554			524, 554
Louisiana	593, 291			593, 291
Maine	49, 551		465	50, 016
Massachusetts	1, 651			1, 651
Michigan	2, 610, 286		5, 462	2, 615, 748
Minnesota	2, 782, 763			2, 782, 763
Mississippi	1, 134, 266			1, 134, 266
Missouri	1, 376, 973		12, 938	1, 389, 911
Montana	16, 670, 543			16, 670, 543
Nebraska	245, 414	103, 985		349, 399
Nevada	5, 062, 932			5, 062, 932
New Hampshire	678, 477			678, 477
New Mexico	8, 932, 080	136, 505	86, 218	9, 154, 803
New York			13, 779	13, 779
North Carolina	1, 125, 278			1, 125, 278
North Dakota	520	1, 104, 438		1, 104, 958
Ohio	119, 082			119, 082
Oklahoma	240, 016	46, 838		286, 854
Oregon	15, 365, 926	102, 980		15, 468, 906
Pennsylvania	475, 961			475, 961
Puerto Rico	27, 889		27	27, 916
South Carolina	587, 753			587, 753
South Dakota	1, 122, 457	856, 691	3, 040	1, 982, 188
Tennessee	600, 845		1, 212	602, 057
Texas	658, 023	117, 269		775, 292
Utah	7, 994, 405			7, 994, 405
Vermont	233, 463			233, 463
Virgin Islands	147			147
Virginia	1, 486, 830			1, 486, 830
Washington	9, 699, 673		520	9, 700, 193
West Virginia	910, 238			910, 238
Wisconsin	1, 475, 241		430	1, 475, 671
Wyoming	8, 595, 261	572, 310		9, 167, 571
Total	182, 834, 316	3, 808, 059	156, 646	186, 799, 021

[1] This column includes all lands administered by the Forest Service, except national grasslands and land utilization project lands which are shown separately.

TABLE 2.—*Volume and value of timber cut and sold in national forests, timber stand improvement, and area planted and seeded to trees, fiscal year 1967*

State and Commonwealth	Timber sold			Timber cut		Timber stand improvement,[2] fiscal year 1967	Area planted and seeded to trees	
	Sales	Volume	Value[1]	Volume	Value[1]		Fiscal year 1967	Total planted and seeded to June 30, 1967
	Number	*Thousand board feet*	*Dollars*	*Thousand board feet*	*Dollars*	*Acres*	*Acres*	*Acres*
Alabama	283	51, 319	1, 333, 706	50, 417	1, 264, 042	7, 525	7, 171	98, 851
Alaska	67	563, 224	3, 013, 864	451, 553	1, 154, 632		26	4, 785
Arizona	857	141, 132	852, 504	325, 021	1, 660, 543	24, 829	2, 094	12, 979
Arkansas	881	134, 328	4, 203, 660	123, 732	3, 938, 185	19, 463	7, 483	74, 838
California	2, 789	2, 135, 546	31, 771, 159	1, 761, 195	25, 145, 013	32, 107	27, 357	250, 125
Colorado	873	119, 133	495, 946	242, 543	1, 281, 172	4, 407	10, 537	118, 051
Florida	277	77, 026	1, 692, 812	90, 694	1, 462, 690	280	8, 228	83, 126
Georgia	323	54, 442	1, 440, 826	54, 518	1, 593, 807	4, 127	1, 595	56, 080
Idaho	1, 839	1, 108, 882	8, 055, 658	913, 766	6, 996, 037	6, 915	21, 470	225, 390
Illinois	46	9, 134	174, 736	4, 948	120, 023	522	1, 015	52, 790
Indiana	49	4, 075	50, 464	4, 877	57, 000	731	1, 316	30, 157
Kentucky	290	29, 295	336, 636	26, 127	351, 387	7, 392	927	5, 752
Louisiana	238	97, 068	2, 465, 250	76, 635	1, 748, 688	11, 445	3, 983	168, 972
Maine	4	4, 471	78, 957	6, 193	68, 537	322	16	83
Michigan	578	156, 359	1, 045, 393	153, 208	973, 155	8, 712	10, 152	666, 105
Minnesota	565	243, 119	1, 000, 011	134, 898	756, 597	8, 296	11, 119	217, 070
Mississippi	912	153, 159	4, 052, 051	130, 840	2, 937, 299	33, 624	9, 110	256, 432
Missouri	506	47, 423	542, 616	50, 864	677, 943	33, 333	5, 044	115, 523
Montana	1, 771	729, 013	8, 051, 947	730, 948	7, 217, 179	13, 088	15, 095	114, 673
Nebraska	12	25	153	21	138	75	801	34, 019
Nevada	27	1, 113	1, 455	427	1, 067	756	201	1, 062
New Hampshire	60	31, 174	396, 927	24, 367	276, 197	8, 392		1, 189
New Mexico	1, 935	316, 382	1, 199, 710	131, 270	600, 807	11, 654	3, 211	18, 361
New York	3	6	98	7	97	48		42
North Carolina	356	62, 981	1, 007, 454	50, 603	1, 006, 828	9, 130	3, 049	44, 568
North Dakota	13	22	205	20	162			
Ohio	58	5, 645	78, 632	5, 461	58, 348	480	1, 217	23, 701
Oklahoma	77	6, 170	178, 558	7, 925	229, 845	1, 588	443	13, 571
Oregon	2, 852	3, 196, 513	94, 402, 939	3, 026, 065	84, 089, 592	74, 823	56, 975	542, 499
Pennsylvania	88	38, 046	1, 271, 420	31, 117	1, 022, 723	13, 768	4	19, 858
Puerto Rico				2	30			
South Carolina	247	115, 640	2, 887, 347	110, 362	3, 198, 929	4, 314	4, 861	40, 117
South Dakota	173	99, 552	398, 759	56, 391	229, 781	6, 713	810	46, 499
Tennessee	217	38, 252	522, 509	24, 496	331, 287	4, 516	631	14, 544
Texas	229	71, 021	2, 251, 128	107, 499	3, 300, 276	4, 716	3, 718	65, 922
Utah	599	74, 732	248, 505	51, 892	220, 859	8, 030	2, 288	16, 362
Vermont	23	17, 814	1, 216, 147	17, 092	599, 236	4, 577		1, 430
Virginia	394	77, 115	639, 950	59, 242	462, 925	9, 266	2, 748	14, 527
Washington	1, 763	1, 374, 240	29, 298, 176	1, 557, 003	31, 924, 791	15, 702	22, 290	329, 233
West Virginia	203	58, 607	988, 931	42, 784	722, 744	15, 086	1, 643	21, 972
Wisconsin	321	92, 411	681, 506	93, 874	545, 624	5, 628	6, 447	263, 509
Wyoming	468	119, 038	274, 880	120, 033	484, 154	6, 505	1, 851	17, 880
Total	23, 266	11, 654, 647	208, 603, 585	10, 850, 930	188, 710, 969	422, 885	256, 926	4, 082, 647

[1] Includes amounts authorized by the Knutson-Vandenberg Act of June 9, 1930 (46 Stat. 527; 16 U.S.C. 576b) for reforestation and timber stand improvement.

[2] Includes release, weeding, thinning, and pruning only.

TABLE 3.—*Estimated legal harvest of principal big-game animals* [1] *in national forests and national grasslands, fiscal year 1967*

State	Deer	Elk	Bear	Antelope	Moose	Turkey [2]
Alabama	1,100		9			670
Alaska	14,000	120	800		340	
Arizona	15,000	1,900	160	300		2,380
Arkansas	2,300					370
California	41,000		960	60		
Colorado	52,000	14,000	590	350		490
Connecticut	30		4			
Florida	1,900		40			530
Georgia	3,500		3			150
Idaho	46,000	13,000	2,000	1,000	150	10
Illinois	2,300					20
Indiana	390					
Kansas						
Kentucky	100					5
Louisiana	1,700					
Maine	140		10			
Michigan	17,000		280			70
Minnesota	15,000		260			
Mississippi	3,200					830
Missouri	4,500					320
Montana	42,000	8,900	1,600	1,100	580	210
Nebraska	730			210		260
Nevada	9,300			15		
New Hampshire	780		100		2	
New Mexico	17,000	510	190	90		1,200
New York	150					
North Carolina	3,900		240			30
North Dakota	4,200			460		
Ohio	60					2
Oklahoma	140					130
Oregon	75,000	8,700	1,000	30		30
Pennsylvania	6,100		60			940
South Carolina	1,300					220
South Dakota	6,600	50		800		670
Tennessee	1,300		20			80
Texas	1,200					4
Utah	63,000	1,100	40		9	70
Vermont	1,200		100			
Virginia	9,500		110			2,500
Washington	24,000	7,400	1,200			
West Virginia	4,700		20			550
Wisconsin	9,400		160			
Wyoming	28,000	12,000	380	3,200	800	950
Total	530,000	67,000	10,000	7,600	1,900	14,000

[1] Legal harvest of other big-game animals for all lands administered by the Forest Service include 3,760 Peccary, 1,470 Mountain Goats, 325 Bighorn Sheep, 40 Dall Sheep, and 410 Wild Boar.

[2] Turkey classed as a big-game species for this report.

NOTE.—Figures rounded, both for States and totals.

TABLE 4.—*Construction, reconstruction, and maintenance of national forest (forest development) roads bridges, and trails, fiscal year 1967*

State and Commonwealth	Roads				Bridges, construction	Trails		Total obligations from all U.S. funds
	Construction and reconstruction	Construction and reconstruction by timber purchasers		Existing		Construction and reconstruction	Existing	
	Miles	*Miles*	*Dollars*	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	9. 2			788. 1				473, 646. 12
Alaska	9. 8	10. 2	574, 866. 00	306. 4	2	7. 3	456. 2	2, 064, 201. 00
Arizona	50. 8	67. 6	608, 809. 00	10, 603. 7	3	17. 0	3, 587. 8	3, 418, 970. 92
Arkansas	6. 3	7. 2	52, 365. 00	2, 569. 2				1, 181, 583. 70
California	96. 5	766. 1	9, 956, 422. 00	36, 104. 4	15	88. 7	15, 468. 1	30, 603, 981. 86
Colorado	131. 3	48. 8	291, 143. 00	12, 447. 9	8	141. 1	9, 712. 0	5, 896, 432. 46
Florida	45. 5	10. 2	42, 390. 00	1, 134. 9	1			446, 665. 19
Georgia	8. 9			1, 256. 4	3	1. 0	190. 4	709, 100. 23
Idaho	169. 3	510. 3	4, 725, 031. 00	17, 449. 7	31	90. 6	19, 003. 2	9, 662, 282. 24
Illinois	7. 2			415. 4			57. 9	372, 354. 00
Indiana	2. 5			1, 102. 3				187, 525. 00
Kansas				62. 2				5, 475. 00
Kentucky	6. 2	15. 7	54, 050. 00	972. 5			115. 1	481, 826. 62
Louisiana	10. 4	55. 8	149, 528. 00	997. 7	20			498, 082. 70
Maine				57. 8			85. 8	38, 412. 00
Michigan	35. 7			4, 994. 8	4		67. 3	1, 638, 140. 00
Minnesota	28. 8	9. 2	28, 000. 00	3, 408. 2			479. 7	1, 896, 857. 00
Mississippi	4. 8	87. 7	266, 527. 00	960. 6	6		5. 0	516, 521. 21
Missouri	20. 4			1, 759. 7	1		67. 0	598, 249. 00
Montana	102. 5	485. 5	2, 872, 818. 00	14, 923. 4	19	50. 7	14, 679. 8	7, 180, 210. 64
Nebraska	5. 3			337. 4			1. 0	250, 933. 00
Nevada	27. 4			3, 229. 5	3	5. 2	1, 811. 5	842, 810. 99
New Hampshire	2. 3	1. 9	19, 259. 00	281. 5			1, 047. 7	461, 873. 00
New Mexico	37. 6	27. 0	42, 500. 00	8, 554. 6	2	9. 1	3, 789. 4	2, 790, 675. 59
New York				10. 1			13. 0	2, 284. 00
North Carolina	16. 5	3. 4	17, 000. 00	1, 168. 7			1, 209. 8	1, 248, 739. 50
North Dakota	16. 6			1, 399. 8	1			114, 785. 07
Ohio	4. 6			309. 1				322, 339. 00
Oklahoma				224. 0				52, 169. 16
Oregon	228. 0	1, 363. 4	17, 697, 892. 00	28, 835. 3	24	66. 4	7, 873. 2	20, 507, 045. 57
Pennsylvania	24. 6	33. 9	229. 628. 00	905. 6	2		94. 8	1, 853, 497. 00
Puerto Rico				. 6		5. 4	38. 9	23, 173. 00
South Carolina	6. 5	10. 3	185, 497. 00	984. 6	2	4. 0	2. 8	446, 470. 66
South Dakota	14. 3	5. 0	31, 015. 00	2, 453. 4			21. 3	578, 483. 70
Tennessee	17. 4			809. 6		7. 0	566. 0	735, 724. 43
Texas	9. 0		36, 858. 00	797. 7	8			646, 000. 45
Utah	90. 1	12. 8	41, 331. 12	6, 801. 1	1	20. 9	6, 099. 8	3, 452, 819. 95
Vermont	3. 3		20, 852. 00	119. 9			194. 3	314, 186. 00
Virginia	14. 1	8. 0	167, 695. 00	1, 445. 8			1, 183. 9	1, 001, 610. 59
Washington	88. 7	680. 8	12, 363, 929. 00	11, 829. 6	14	97. 5	7, 702. 5	8, 911, 588. 30
West Virginia	27. 8	6. 2	45, 219. 00	1, 613. 3			783. 7	1, 162, 223. 70
Wisconsin	42. 8	4. 7	6, 754. 00	3, 003. 8	1		39. 3	1, 167, 642. 00
Wyoming	59. 8	39. 3	187, 979. 00	5, 684. 6	10	65. 1	5, 577. 8	3, 251, 419. 47
WO								1, 699, 363. 59
Total	1, 482. 8	4, 271. 0	50, 715, 357. 12	193, 114. 9	181	677. 0	102, 026. 0	119, 708, 374. 61

TABLE 5.—*Recreation sites and capacities in the national forests and national grasslands as of June 30, 1967*

Type of facility	Number of sites, classed according to persons at one-time capacity						Area	Normal capacity (persons at one time)
	Under 25	26 to 75	76 to 300	301 to 1,000	Over 1,000	Total		
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Number*
Campgrounds	2, 811	1, 736	1, 331	139	8	6, 025	36, 352	381, 905
Picnic grounds	613	678	342	37	1	1, 671	7, 408	108, 548
Subtotal	3, 424	2, 414	1, 673	176	9	7, 696	43, 760	490, 453
Organization camps owned by Forest Service	5	23	41	1	-------	70	1, 079	7, 697
Organization camps in private ownership	64	106	308	23	2	503	6, 066	66, 146
Hotels, lodges, resorts owned by Forest Service	3	5	6	-------	1	15	267	2, 858
Hotels, lodges, resorts in private ownership	72	183	127	16	2	400	3, 205	52, 793
Other public service sites	61	64	29	8	1	163	594	13, 233
Recreation residence sites	1, 317	329	308	56	5	2, 015	16, 892	141, 088
Swimming sites	12	82	146	30	1	271	564	45, 566
Boating sites	251	226	167	28	1	673	1, 246	56, 113
Winter sports sites	9	10	49	52	82	202	24, 802	307, 225
Observation sites	191	131	68	7	-------	397	1, 531	22, 633
Playground, park, sports sites	2	5	11	2	-------	20	179	3, 412
Visitor centers	6	8	16	4	1	35	423	9, 720
Total	5, 417	3, 586	2, 949	403	105	12, 460	100, 608	1, 218, 937

TABLE 6.—*Use of recreation resources on the national forests, national*

[Number of visitor-days of

State	Observation sites	Playgrounds, sports sites	Boating sites	Swimming sites	Camp-grounds	Picnic grounds	Hotel, lodge, resorts
Alabama			6. 9	35. 6	76. 8	98. 7	
Alaska	6. 2		2. 2	. 2	129. 5	67. 6	16. 3
Arizona	14. 8	10. 1	34. 8	11. 6	1, 109. 2	512. 3	299. 9
Arkansas	3. 1		6. 7	75. 3	226. 0	92. 3	57. 6
California	60. 9	3. 6	157. 1	159. 9	9, 759. 0	596. 9	1, 584. 7
Colorado	93. 7		33. 5		1, 442. 0	226. 1	76. 8
Florida			24. 8	83. 4	531. 6	81. 7	
Georgia	4. 1		3. 8	15. 2	269. 5	36. 3	6. 3
Idaho	20. 1		34. 5	21. 4	1, 251. 5	125. 0	169. 4
Illinois	27. 3		1. 4	25. 3	135. 9	55. 3	
Indiana	2. 2		16. 8	14. 4	48. 5	53. 6	
Kansas						1. 9	
Kentucky	9. 3		6. 5		73. 2	34. 4	
Louisiana	. 2		1. 9	64. 1	89. 3	45. 6	
Maine	1. 9				10. 2	2. 0	
Michigan	3. 3	4. 3	50. 8	49. 4	492. 2	78. 4	. 7
Minnesota	. 2		61. 1	27. 5	886. 6	43. 3	113. 6
Mississippi			6. 3	13. 6	78. 9	58. 6	
Missouri	3. 0		9. 6	6. 9	208. 3	103. 6	
Montana	67. 5		52. 1	25. 9	746. 5	143. 9	87. 4
Nebraska	3. 4			. 5	6. 4	5. 6	
Nevada	. 3	3. 9		8. 7	234. 2	45. 4	
New Hampshire	21. 9		. 5	3. 5	459. 5	62. 1	65. 6
New Mexico	28. 5	6. 2	. 6		576. 9	180. 5	9. 5
New York					5. 3	. 5	
North Carolina	25. 2		10. 7	18. 3	353. 9	200. 8	14. 8
North Dakota					1. 0	2. 3	
Ohio			7. 0	22. 0	64. 1	81. 1	
Oklahoma	3. 1		2. 1	22. 8	48. 2	28. 1	
Oregon	78. 1		700. 1	77. 1	4, 744. 1	492. 3	715. 5
Pennsylvania	17. 7		. 8	16. 9	90. 3	38. 5	
South Carolina			2. 7	6. 9	20. 2	46. 0	
South Dakota	4. 3		7. 1	7. 1	231. 2	66. 9	6. 0
Tennessee	2. 5		3. 8	22. 7	218. 3	68. 3	50. 0
Texas	. 4		17. 3	27. 9	365. 1	104. 8	2. 9
Utah	43. 2	. 4	45. 5	2. 4	1, 604. 3	287. 7	202. 0
Vermont	4. 7			4. 3	47. 3	13. 8	
Virginia	6. 9		3. 1	28. 5	252. 0	72. 3	. 1
Washington	70. 7		89. 4	17. 0	2, 310. 5	142. 8	136. 6
West Virginia	6. 4		1. 2	9. 6	257. 2	41. 9	
Wisconsin			38. 3	29. 0	266. 2	32. 7	4. 6
Wyoming	32. 6		8. 8	14. 7	509. 8	66. 7	277. 6
Puerto Rico	12. 8			3. 1		70. 9	8. 6
Servicewide	680. 5	28. 5	1, 449. 8	972. 7	30, 230. 7	4, 609. 5	3, 906. 5

[1] Recreation use of national forest land and water which aggregates 12 person-hours. May entail 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

grasslands, and other lands administered by the Forest Service, calendar year 1967

recreation use,[1] in thousands.]

Organization sites	Commercial service sites	Recreation residence sites	Winter sports sites	Visitor centers	Dispersed use	Total visitor-days	State
					451.7	669.7	Alabama.
33.3		47.7	77.2	16.2	744.7	1,141.1	Alaska.
221.4	22.8	248.4	13.5	4.9	3,472.2	5,975.9	Arizona.
42.1		15.6		2.3	989.6	1,510.6	Arkansas.
2,908.2	183.3	4,799.2	1,555.6	56.9	23,007.7	44,833.0	California.
128.1	65.6	179.0	760.7		5,640.2	8,645.7	Colorado.
89.2		135.9		.7	1,447.6	2,394.9	Florida.
33.0		23.0		12.7	863.7	1,267.6	Georgia.
191.4	7.9	237.4	255.8	1.4	5,242.9	7,558.7	Idaho.
					450.0	695.2	Illinois.
					221.3	356.8	Indiana.
					4.7	6.6	Kansas.
7.9		9.0			417.5	557.8	Kentucky.
44.3		6.7			122.7	374.8	Louisiana.
.8					19.3	34.2	Maine.
53.2	6.2	55.9	109.3		2,137.3	3,041.0	Michigan.
47.1	3.2	154.0	17.1	2.4	1,827.3	3,183.4	Minnesota.
68.6					411.9	637.9	Mississippi.
5.0					1,029.0	1,365.4	Missouri.
69.3	1.2	395.2	144.7	6.1	3,825.5	5,565.3	Montana.
18.5					44.9	79.3	Nebraska.
91.6		25.9	64.8		608.0	1,082.8	Nevada.
18.0			170.9	1.7	884.3	1,688.0	New Hampshire.
61.9	.1	84.7	109.5	5.2	2,258.4	3,322.0	New Mexico.
13.4					15.9	35.1	New York.
5.6	4.0	9.4		3.2	1,382.8	2,028.7	North Carolina.
					42.3	45.6	North Dakota.
					402.3	576.5	Ohio.
					227.9	332.2	Oklahoma.
397.8	202.1	534.1	507.5	11.4	10,249.2	18,709.3	Oregon.
67.1		43.6			1,060.7	1,335.6	Pennsylvania.
					504.9	580.7	South Carolina.
46.7	1.0	56.0	13.2	3.3	890.0	1,332.8	South Dakota.
88.0		71.0			830.1	1,354.7	Tennessee.
4.8					708.5	1,231.7	Texas.
159.8	11.3	159.1	241.3	4.8	3,731.8	6,493.6	Utah.
			225.1		548.0	843.2	Vermont.
55.7		1.3			1,980.9	2,400.8	Virginia.
249.2	8.0	204.9	709.6	.3	5,916.7	9,855.7	Washington.
39.3		.4		4.4	689.6	1,050.0	West Virginia.
23.8		10.2	11.6		1,187.3	1,603.7	Wisconsin.
211.5	6.6	180.7	114.9	.2	2,217.3	3,641.4	Puerto Rico.
47.0		1.6		.4	63.7	208.1	
5,542.6	523.3	7,689.9	5,102.3	138.5	88,772.3	149,647.1	Servicewide.

TABLE 7.—*Distribution of forest and windbarrier planting stock by cooperating States, fiscal year 1967 (under Clarke-McNary program)*

State and Commonwealth	Expenditures derived from—				Trees distributed
	Federal allotment	State appropriation	Receipts	All sources	
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Number*
Alabama	3,000	7,265	224,304	234,569	47,810,000
Arkansas	3,000	46,611	64,825	114,436	11,247,000
California	3,000	70,817	49,105	122,922	2,564,000
Colorado	4,920	4,920	40,237	50,077	415,000
Connecticut	3,000	24,650	32,231	59,881	1,147,000
Delaware	3,000	17,011		20,011	987,000
Florida			290,984	290,984	62,091,000
Georgia	3,000	43,546	307,436	353,982	54,783,000
Hawaii	3,000	123,974		126,974	1,462,000
Idaho	12,000	27,455	11,670	51,125	579,000
Illinois	3,000	68,013	55,417	126,430	5,432,000
Indiana	3,000	102,473	96,311	201,784	5,522,000
Iowa		11,149	38,628	49,777	923,000
Kansas	12,000	60,730	38,000	110,730	814,000
Kentucky	3,000	147,408	85,402	235,810	8,066,000
Louisiana	3,000	34,311	159,461	196,772	35,143,000
Maine	3,000	32,973	60,306	96,279	1,232,000
Maryland	3,000	49,760	3,390	56,150	5,969,000
Massachusetts	3,000	32,634	12,354	47,988	552,000
Michigan	3,000	78,700	69,700	151,400	5,406,000
Minnesota	3,000	348,555	105,982	457,537	21,278,000
Mississippi	3,000	203,893	168,084	374,977	39,274,000
Missouri	3,000	76,508	59,186	138,694	5,799,000
Montana	12,000	54,307	33,963	100,270	952,000
Nebraska	10,470	11,241	99,224	120,935	2,351,000
Nevada	9,873	20,393	10,519	40,785	85,000
New Hampshire	3,000	28,675	10,886	42,561	824,000
New Jersey	3,000	22,713	11,610	37,323	988,000
New Mexico	12,000	17,691	6,195	35,886	176,000
New York	3,000	228,904	137,116	369,020	17,235,000
North Carolina	3,000	57,256	266,062	326,318	42,226,000
North Dakota	12,000	82,304	28,905	123,209	835,000
Ohio	3,000	160,685	115,978	279,663	11,750,000
Oklahoma	12,000	31,971	6,861	50,832	518,000
Oregon			214,420	214,420	12,841,000
Pennsylvania	3,000	244,578	89,134	336,712	14,227,000
Puerto Rico	2,992	78,000		80,992	1,375,000
Rhode Island	2,855	5,710	4,345	12,910	247,000
South Carolina	3,000	66,497	206,205	275,702	44,838,000
South Dakota	12,000	23,394	63,324	98,718	1,550,000
Tennessee	3,000	44,620	76,455	124,075	14,753,000
Texas	3,000	15,879	42,759	61,638	6,093,000
Utah	6,000	6,499	8,099	20,598	110,000
Vermont	3,000	50,377	23,512	76,889	1,285,000
Virginia	3,000	208,257	191,736	402,993	39,598,000
Washington			277,430	277,430	8,645,000
West Virginia	3,000	132,723	140,439	276,162	10,750,000
Wisconsin	3,000	182,713	323,885	509,598	19,180,000
Wyoming	3,000	3,584	8,260	14,844	160,000
Total	217,110	3,392,327	4,370,335	7,979,772	572,087,000

TABLE 8.—*Planting stock available for forest and windbarrier planting; area planted or seeded on Federal, State, and private lands; and acreage in need of planting*

State and Commonwealth	Planting stock shipped, fiscal year 1967				Area planted or seeded, fiscal year 1967	Planting needs 1958 [1]
	Federal nurseries	State nurseries	Other	Total		
	Thousands	*Thousands*	*Thousands*	*Thousands*	*Acres*	*Acres*
Alabama		50, 494	13, 712	64, 206	98, 269	5, 006, 000
Alaska					26	
Arizona					2, 094	40, 000
Arkansas		12, 747		12, 747	19, 464	1, 405, 000
California	14, 715	2, 900	1, 085	18, 700	43, 948	3, 001, 000
Colorado	6, 130	601		6, 731	13, 512	318, 000
Connecticut		1, 667	63	1, 730	1, 441	111, 000
Delaware		987		987	980	11, 000
Florida		71, 592	24, 173	95, 765	157, 908	7, 033, 000
Georgia		61, 588	51, 081	112, 669	135, 249	6, 344, 000
Hawaii		1, 464	40	1, 504	2, 801	810, 000
Idaho	14, 868	586	1	15, 455	24, 925	691, 000
Illinois		7, 942		7, 942	6, 490	904, 000
Indiana		7, 821		7, 821	5, 972	330, 000
Iowa		1, 074	250	1, 324	1, 607	264, 000
Kansas			340	340	1, 972	230, 000
Kentucky		9, 004	3, 141	12, 145	15, 537	2, 004, 000
Louisiana		36, 839	6, 173	43, 012	49, 646	2, 379, 000
Maine		861	1, 000	1, 861	2, 569	1, 171, 000
Maryland		5, 969		5, 969	6, 078	455, 000
Massachusetts		552	50	602	1, 213	254, 000
Michigan	11, 238	5, 406	17, 250	33, 894	17, 963	1, 424, 000
Minnesota	5, 383	21, 378	1, 000	27, 761	37, 371	5, 427, 000
Mississippi	27, 946	38, 529		66, 475	66, 674	2, 255, 000
Missouri		6, 863		6, 863	11, 721	3, 200, 000
Montana	1, 253	1, 027	1, 256	3, 536	19, 308	931, 000
Nebraska	5, 885		3, 500	9, 385	7, 640	87, 000
Nevada		59		59	350	30, 000
New Hampshire		824		824	825	464, 000
New Jersey		988	400	1, 388	1, 331	819, 000
New Mexico			35	35	3, 598	245, 000
New York		18, 104	2, 104	20, 208	17, 636	1, 378, 000
North Carolina		41, 931	11, 413	53, 344	57, 286	2, 841, 000
North Dakota		1, 163	5, 990	7, 153	8, 182	231, 000
Ohio		11, 827		11, 827	18, 465	616, 000
Oklahoma		1, 568		1, 568	1, 630	1, 054, 000
Oregon	6, 049	22, 432	6, 329	34, 810	164, 054	2, 008, 000
Pennsylvania		15, 039	33, 345	48, 384	52, 803	869, 000
Puerto Rico		1, 375		1, 375	1, 250	105, 000
Rhode Island					377	85, 000
South Carolina		46, 967	11, 051	58, 018	59, 078	2, 269, 000
South Dakota	925	921	1, 460	3, 306	9, 129	129, 000
Tennessee		21, 051	13, 200	34, 251	21, 496	1, 181, 000
Texas		6, 088	6, 260	12, 348	28, 869	2, 235, 000
Utah		110	20	130	2, 403	46, 000
Vermont		1, 285	100	1, 385	1, 348	274, 000
Virginia		44, 031	11, 360	55, 391	74, 920	880, 000
Washington	12, 899	13, 520	5, 029	31, 448	83, 606	1, 136, 000
West Virginia		11, 133	85	11, 218	13, 644	567, 000
Wisconsin		19, 174	3, 275	22, 449	30, 511	5, 172, 000
Wyoming					2, 521	103, 000
Total	107, 291	627, 481	235, 571	970, 343	1, 407, 690	70, 822, 000

[1] As reported in the National Inventory of Soil and Water Conservation Needs, 1962.

TABLE 9.—*Cooperative forest management progress and expenditures, fiscal year 1967*

[U.S. Forest Service and State foresters cooperating]

State	Progress				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*M. Bd. Ft.*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	655	77, 660	12, 534	892, 394	44, 087	44, 087	88, 174
Alaska	13	780			9, 247	9, 247	18, 494
Arkansas	748	87, 494	1, 349	35, 157	50, 300	50, 300	100, 600
California	2, 124	231, 038	46, 111	1, 360, 685	57, 600	88, 174	145, 774
Colorado	641	112, 538	393	23, 477	39, 200	75, 155	114, 355
Connecticut	1, 339	72, 378	569	184, 359	32, 900	40, 113	73, 013
Delaware	20	443	220	7, 000	3, 513	3, 513	7, 026
Florida	3, 940	785, 209	12, 209	1, 858, 060	139, 900	290, 062	429, 962
Georgia	5, 006	604, 680	17, 026	1, 764, 091	131, 400	172, 655	304, 055
Hawaii	281	8, 614	520	70, 152	12, 000	17, 154	29, 154
Idaho	1, 277	108, 623	1, 101	228, 664	29, 499	29, 499	58, 998
Illinois	1, 816	36, 634	5, 213	437, 917	70, 200	97, 314	167, 514
Indiana	1, 568	56, 456	7, 907	440, 826	51, 236	63, 342	114, 578
Iowa	2, 608	15, 393	879	115, 815	41, 300	51, 200	92, 500
Kansas	1, 197	24, 012	241	55, 180	32, 700	60, 320	93, 020
Kentucky	2, 653	73, 882	5, 895	252, 386	122, 400	351, 171	473, 571
Louisiana	463	56, 224	7, 168	304, 067	52, 300	80, 526	132, 826
Maine	1, 484	86, 986	7, 540	421, 771	77, 300	129, 935	207, 235
Maryland	1, 978	39, 018	5, 136	203, 776	59, 000	119, 997	178, 997
Massachusetts	2, 566	43, 365	7, 934	165, 237	35, 640	37, 657	73, 297
Michigan	1, 756	65, 217	7, 181	273, 664	96, 100	265, 262	361, 362
Minnesota	2, 596	45, 926	1, 143	378, 608	73, 300	74, 894	148, 194
Mississippi	3, 985	310, 506	3, 914	211, 593	75, 600	113, 919	189, 519
Missouri	3, 245	203, 416	21, 838	581, 316	112, 800	237, 644	350, 444
Montana	345	18, 629	620	15, 020	28, 118	28, 118	56, 236
Nebraska	912	7, 655	853	158, 531	32, 600	37, 070	69, 670
Nevada	71	228			15, 425	17, 276	32, 701
New Hampshire	2, 759	121, 182	8, 994	618, 892	42, 700	62, 424	105, 124
New Jersey	814	16, 271	1, 819	82, 875	37, 800	55, 434	93, 234
New Mexico	273	342, 061	4, 409	34, 614	30, 200	34, 860	65, 060
New York	9, 155	298, 538	26, 171	966, 772	168, 600	300, 891	469, 491
North Carolina	9, 676	125, 557	23, 861	903, 635	171, 400	327, 954	499, 354
North Dakota	220	13, 071	8, 623	51, 990	30, 400	30, 961	61, 361
Ohio	2, 610	57, 171	9, 387	439, 379	96, 100	132, 293	228, 393
Oklahoma	202	13, 820	3	4, 616	17, 402	17, 403	34, 805
Oregon	1, 785	113, 895	5, 328	330, 735	33, 100	35, 156	68, 256
Pennsylvania	3, 834	80, 608	8, 861	233, 092	119, 600	170, 834	290, 434
Rhode Island	351	16, 327	188	2, 904	8, 564	8, 564	17, 128
South Carolina	3, 725	230, 060	14, 905	565, 354	91, 400	136, 694	228, 094
South Dakota	531	6, 148		700	22, 000	24, 979	46, 979
Tennessee	1, 688	99, 535	9, 324	374, 428	71, 261	71, 261	142, 522
Texas	1, 400	781, 513	14	674	52, 500	58, 995	111, 495
Utah	281	133, 637	48	334	19, 143	19, 143	38, 286
Vermont	3, 361	84, 685	13, 765	593, 425	70, 000	145, 215	215, 215
Virginia	6, 126	251, 891	162, 596	4, 731, 299	178, 600	300, 200	478, 800
Washington	2, 021	72, 695	25, 186	853, 963	47, 300	68, 515	115, 815
West Virginia	2, 312	36, 541	2, 324	68, 493	71, 400	78, 796	150, 196
Wisconsin	7, 140	160, 767	16, 065	706, 691	208, 400	311, 583	519, 983
Wyoming	7	1, 616			13, 551	13, 551	27, 102
U.S. total	105, 558	6, 230, 593	517, 365	22, 004, 611	3, 127, 086	4, 991, 310	8, 118, 396
Puerto Rico	2, 092	1, 474	3	573	27, 500	27, 500	55, 000
Virgin Islands	4	55			2, 157	2, 157	4, 314
Grand total	107, 654	6, 232, 122	517, 368	22, 005, 184	3, 156, 743	5, 020, 967	8, 177, 710

TABLE 10.—*Pest control accomplishments, fiscal year 1967*

OAK WILT CONTROL

Ownership or management	Area surveyed	Trees treated	Ownership or management	Area surveyed	Trees treated
National forest:	*M acres*	*Number*	State and private:	*M acres*	*Number*
George Washington	800	131	Pennsylvania	21, 760	4, 188
Monongahela	1, 611	91	Virginia	1, 366	122
Nicolet		400	West Virginia	17, 038	2, 867
			North Carolina	2, 771	37
Subtotal	2, 411	622	Subtotal	42, 935	7, 214
			Grand total	45, 346	7, 836

INSECT CONTROL

Ownership or management	Bark beetles	Defoliators	Other insects	
	Trees treated [1]	Area treated	Area treated	Trees treated
	Number	*Acres*	*Acres*	*Number*
National forest	794, 587	32, 353	1, 232	210, 980
State and private	292, 488	94, 095	375	364, 500
Total	1, 087, 075	126, 448	1, 607	575, 480

[1] Includes infested trees, stumps, and cull logs.

BLISTER RUST CONTROL

Ownership or management	Premaintenance		Maintenance		Ribes eradicated
	Surveyed [1]	Treated	Surveyed [1]	Treated	
	Acres	*Acres*	*Acres*	*Acres*	*Number*
National forest	138, 246	26, 364	87, 658	6, 927	5, 227, 388
State and private	248, 956	49, 336	1, 488, 823	64, 914	2, 611, 471
Total	387, 202	75, 700	1, 576, 481	71, 841	7, 838, 859

[1] Systematically inspected to locate area in need of treatment and to determine effectiveness of control.

TABLE 11.—*Forest Service receipts and expenditures, all programs and sources, fiscal year 1967*

Item	Receipts	Expenditures
	Dollars	*Dollars*
National forest programs:		
Cash receipts and appropriation expenditures	224, 496, 855	357, 101, 561
Cash receipts from national forest land collected in conjunction with and deposited to accounts of other agencies (Federal Power Commission, Department of the Interior)	22, 115, 967	
Noncash income and expense (roads built by timber purchasers)	50, 715, 357	50, 715, 357
Total	297, 328, 179	407, 816, 918
Forest research programs:		
Forest research appropriations		35, 559, 765
Cooperative research work	826, 562	861, 254
Total	826, 562	36, 421, 019
State and private forestry programs:		
Fire protection, tree distribution, and forest management cooperation		18, 098, 583
Assistance to States for tree planting		1, 002, 289
Insect and disease control		2, 015, 856
Flood prevention and watershed protection		3, 393, 057
Forest fire prevention, "Smokey Bear"	42, 179	37, 248
Cooperative funds	2, 312, 989	2, 377, 677
Total	2, 355, 168	26, 924, 710
Work for other Government agencies and non-Government persons and firms:		
Economic Opportunity program		46, 768, 293
Land and Water Conservation program	[1]	17, 349, 443
Insect and disease control (Interior Department lands)		40, 089
Miscellaneous work for other Government agencies	4, 284, 586	6, 413, 690
Work performed for non-Government persons, firms, etc.—Cooperative work	742, 891	795, 676
Reimbursed	1, 296, 444	1, 296, 444
Total	6, 323, 921	72, 663, 635
Total receipts and expenditures	306, 833, 830	543, 826, 282
Cash receipts distributed to States, counties, and Puerto Rico as directed by Congress (receipts of fiscal year 1966 except as indicated):		
Payments to States and Puerto Rico (act of June 23, 1908) national forest fund		[2] 41, 942, 319
Payments to school funds, Arizona and New Mexico (act of June 20, 1910) national forest fund		102, 931
Payments to Minnesota (Cook, Lake, and St. Louis Counties; Superior National Forest) (act of June 22, 1948) national forest fund		144, 815
Payments to counties, national grasslands and land utilization areas (act of July 22, 1937) (receipts of calendar year 1966)		451, 432
Total		42, 641, 497
Internal equipment and supply service (working capital fund):		
Financed primarily by charges included above to Forest Service programs	26, 805, 407	24, 459, 417

[1] Receipts of $1,322,685 from the sale of Federal recreation area entrance permits were deposited to the credit of the Department of the Interior (BOR) during fiscal year 1967 and are included in the receipts from national forest land ($22,115,967), above.

[2] Does not include approximately $4,474,588 due counties from fiscal year 1966 receipts on national forest O&C lands. This amount was included in total receipts of $5,966,117 transferred to Interior for distribution under act of Aug. 28, 1937 (50 Stat. 874) as amended.

NOTE.—Expenditures are on an obligation basis, except Working Capital Fund, which is on an accrual basis.

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